Media Vault™
4400 Series

User Manual

Release Date: 03/08

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This version of the MediaVault MV 4440 User Manual supersedes all previous versions.

Recommendations

This User Manual contains information about host adaptors and formatting software that are approved by the companies of manufacture and/or origin. These specially approved host adaptors and formatting software are the only ones approved and recommended for use with the MV 4440.

Contact Information

Ciprico Inc. has several support options for users of its products, in order to access information and updates.

When you contact Ciprico Inc., please have the following information available:

- Product model and serial number
- A description of the problem/situation
- System configuration information, including: hard drive model(s), SATA/PATA drives and devices, and other controllers.

Technical and Sales Support

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Document Change History

Revision Level	Date	Changes
A	March 2008	Initial release of this manual.

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Chapter 1

Safety

In this chapter…

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This section includes general safety precautions, specific Ciprico Inc. precautions, and first aid information. Read this material carefully before working on any components of the MediaVault 4440 (hereafter referred to in this manual as the MV 4440).

Read and keep this User Manual for future reference.

Safety Definitions

The following types of safety precautions appear in this manual:

WARNING: Denotes the possibility of serious damage to equipment and/or serious injury to self.

CAUTION: Denotes the possibility of minor to severe damage to equipment and/or possible injury to self.

Safety Precautions

WARNING: Before installing and using the MV 4440 User Manual read all instructions and caution markings on the equipment.

WARNING: The MV 4400 weighs 49.6 lbs. (22.5 kg). Use two people to lift the unit. Use a cart to transport the unit.

WARNING: To reduce the risk of electrical shock, disconnect AC power from the MV 4440 before attempting any maintenance or cleaning.

WARNING: Do not expose the MV 4440 to any liquids.

WARNING: To reduce risk of fire hazard, do not cover or obstruct the ventilation openings

WARNING: To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that the wire is not undersized. Do not operate the MV 4440 with damaged or substandard wiring.

WARNING: Do not operate the MV 4440 if it has received a sharp blow, been dropped, or has been damaged in any way.

WARNING: Use only attachments recommended or sold by Ciprico. Doing otherwise might result in a risk, improper operation or injury.

CAUTION: Do not upgrade your system if there are any tasks (such as a rebuild) running on any of the arrays.

CAUTION: Deleting a stripe set from the host operating system permanently destroys all data. This action cannot be undone; all data will be lost.

CAUTION: When a task is cancelled, data that is in the part of the task that did not finish could be lost on the destination array.

Important Safety Considerations

TABLE 1-1. Safety Considerations.

Consideration	Risk/Description
Servicing the Unit	Do not attempt to service this unit yourself other than the removal of a vPOD. See Figure 1-1, and see Chapter 8, Maintenance.
Risk of Shock	The power module is removable, but hazardous voltage levels are maintained on a removed power module. After disengaging the power module, do not completely remove the power module for 30 seconds to permit power to dissipate.
Use Near Liquids	Do not use the MV 4440 unit near any liquids.
Unstable surfaces	Do not place this unit on an unstable cart, stand, bracket or table. The unit might fall, causing serious injury and damage to the unit.
Ventilation	Do not block the front and rear ventilation. Proper airflow is required to ensure reliable operation and to protect the product from over heating.
Grounding power plug	Do not defeat the safety purpose of the grounding power plug. Use a grounding type power outlet and the power connector intended for the unit. The power cord should be routed so that they are not likely to be walked on or pinched by items placed upon or against them.
Power cord	The power cord provided is for North America use only. Outside of North America the proper power cord must be procured and used.

Invisible Laser Radiation Warning

Lasers emit visible and invisible radiation from the aperture opening when no fiber-optic cable is connected. When removing cables do not stare into the open apertures. See Figure 1-1.

In addition, install protective aperture covers to fibre ports with no cable connected.

Safety Warning Labels

The following safety labels are located on the MV 4440.

FIGURE 1-1. Class 1 Laser Product - Invisible Laser Radiation Warning.

Important Safety Considerations: French and German Languages

Les Considérations importantes de Sûreté

Pas la tentative pour entretenir cette unité. L'ouverture ou enlever la couverture vous exposera aux tensions dangereuses ou aux autres dangers.

Ne pas utiliser cette unité près de l'eau - tel que; la baignoire, le lavabo, l'évier de cuisine ou le baquet de lessive, dans un sous-sol mouillé de proche une piscine.

Ne pas placer cette unité sur une charrette instable, une position, un crochet ou une table. L'unité peut tomber, causant la blessure et les dommages sérieuse à l'unité.

Ne pas bloquer le devant et la ventilation postérieure. Le flux d'air correct est exigé assurer l'opération fiable et protéger le produit de par-dessus le chauffage.

Ne pas battre le but de sûreté de la prise de courant mettree à terre. Utiliser une sortie de pouvoir qui met à la terre et l'arrivée secteur a projeté pour l'unité. Le cordon d'alimentation devrait être mis en déroute pour qu'ils ne sont pas probables être marché sur ou pincé par les articles placés sur ou contre eux.

Le cordon d'alimentation fourni est pour l'usage d'Amérique du nord seulement. Hors de l'Amérique du nord que le cordon d'alimentation correct doit être procuré et doit être utilisé.

Wichtige Sicherheitsberücksichtigungen

Versuchen Sie nicht, diese Einheit zu warten. Öffnen oder Herausnehmen der Decke werden Sie zu gefährlichen Spannungen oder anderen Gefahren entblößen.

Benutzen Sie dieses Einheit nahes Wasser nicht - wie zum Beispiel; Badewanne, washbowl, Küche Ausguß oder Wäscherei Wanne, in einem nassen Kellergeschoß von nahe einem schwimmenden Teich.

Stellen Sie diese Einheit auf einen unsicheren Wagen, Gestell, Bügel oder Tisch nicht. Die Einheit kann fallen, verursachend ernste Verletzung und Schaden an der Einheit.

Hemmen Sie die Front und die hintere Belüftung nicht. Passender Luftstrom ist erfordert, zuverlässigen Betrieb zu sichern, und, das Produkt von über Heizung zu schützen.

Besiegen Sie den Sicherheitszweck Stöpsel der Erdungskraft nicht. Benutzen Sie einen Erdungstyp Netzanschluß und den Kraft Verbinder haben vorgehabt für die Einheit. Das Netzkabel sollte umgeleitet werden, damit sie nicht wahrscheinlich sind, auf gelaufen zu werden, oder zusammengedrückt durch Punkte, die auf oder gegen sie gestellt werden.

Netzkabel hat für Nördlich Amerika Gebrauch nur versorgt ist. Außerhalb Nördlich Amerikas des passenden Netzkabels muß verschafft werden und muß benutzt werden.

Protecting Equipment and Data

Backing Up Data

Creating or deleting disk arrays destroys existing data on the drives. Always back up the data on the drives and save it to a server or hard-drive before attaching the drives to the controller.

Electrostatic Discharge (ESD)

Static electricity can destroy sensitive electronic components inside a computer. Follow these procedures to prevent damage due to ESD:

- When unpacking a static-sensitive component from the shipping carton, do not remove the component from the anti-static bag until you are ready to install the component. Before you unwrap the anti-static packaging, touch an unpainted metal surface to discharge static electricity from your body.
- When transporting a static-sensitive component, place it in an anti-static container or packaging
- Before touching any computer part, discharge any static charge your might have accumulated. Wear an ESD strap, stand on an ESD mat, or periodically touch an unpainted metal surface, such as the card-slot openings of the computer chassis.
- When the computer case is open and internal components are exposed, do not touch any internal part unnecessarily.
- Do not remove the MV 4440 from its protective bag until you are properly grounded.
- Handle the MV 4440 by its edges.
- Do not touch any pin, connector, lead or component on the MV 4440.

First Aid: Electrical Shock

IMMEDIATE action must be initiated after a person has received an electrical shock. Obtain immediate medical assistance if available.

The source of the shock must be immediately removed by either shutting down the power or removing the victim from the source.

If it is not possible to shut off the power, the wire should be cut with either an insulated instrument or by a rescuer wearing electrically insulated gloves and safety glasses. Whichever method is used do not look at the wire while it is being cut. The ensuing flash can cause burns and blindness.

If the victim has to be removed from a live circuit, pull the victim off with a non-conductive material.

DO NOT TOUCH the victim! You can receive a shock from current flowing through the victim's body.

Use the victim's coat, a rope, wood, or loop your belt around the victim's leg or arm and pull the victim off.

After separating the victim from power source, check immediately for the presence of a pulse and respiration.

If a pulse is not present, start CPR (Cardio-Pulmonary Resuscitation) and call for emergency medical assistance. If a pulse is present, respiration may be restored by using mouth-to-mouth resuscitation, but call for emergency medical assistance.

Chapter 2

Introduction

In this chapter…

About Your MV 4440 2-2
Who Should Use This Manual 2-3

About Your MV 4440

Congratulations on purchasing the MV 4440 from Ciprico Inc., a leader in performance, quality, and storage for video editing and storage.

The MV 4440 contains 4 modules, called "vPODs". Each vPOD is a 10-drive array. The MV 4440 storage system utilizes the latest RAID 6 drive protection and 4Gb Fibre Channel interface technology. RAID 6 provides for two-drive-down redundancy. In an unlikely event that two drives are down in a vPOD the data is still protected and available.

TABLE 2-1. Features of the MV 4440.

Feature	Number or Value
Fibre Channels	Two 4Gb Fibre Channels, with two ports per channel
Fibre Channel interface	Compatible with earlier generation optical Fibre Channel
RAID Controller	One per vPOD
RAID levels	RAID 0 or RAID 6 modes
vPOD	The MV 4440 consists of four vPODs. Each vPOD has ten 2.5-inch disk drives and a RAID controller. The system therefore can contain up to 4 vPODs (40 disk drives and four RAID controllers)
Disk drive modules	40 2.5-inch disk drive modules
Real Time RAID (RTR) capability	RTR reconstructs data "on the fly" should a drive "glitch"
Data rate (internal)	500 MBytes/sec per RAID controller
Date rate for four striped vPODs	1000-1200 MBytes/sec
Burst rate (maximum) per channel	380 MBytes/sec per RAID controller
Sustained data rate per channel	300 MBtyes/sec per RAID controller
Mode Selection	Easy user selection of functionality via Mode Selection and Mode Set switches. No complicated software setup or maintenance
Fans	Multiple cooling fans
Serial port	One serial port on each vPOD for maintenance and support
Alarm	Audible alarm and LED indicators
Power Supply	One removable power supply module (containing two power supplies)

Who Should Use This Manual

Only trained, experienced, and authorized personnel should install and operate the MV 4440.

The intended user audience are system administrators and experienced users who understand and have used of one or more of the following operating systems:

- Microsoft Windows®
- Macintosh®
- Linux®
- Unix®
- SGI Irix®
- Sun Solaris®

For specific supported versions of each operating system, see the list given on the Ciprico Inc. website:

http://www.ciprico.com

Chapter 3

Getting Started

In this chapter…

Unpacking 3-2
Checking the Package Contents 3-3
Inspection 3-4

Unpacking

Remove all components from the shipping container.

Retain all boxes and packing materials in case you might need to reuse them later. Be sure to ship the unit in the original Ciprico Inc. packaging.

If the unit is improperly packaged, and the unit is damaged during shipping, there could be a delay in repairing the unit, and you will be liable for the damage.

Examine the components for shipping damage. See the “Inspection” section on page 3-4. Contact the freight carrier immediately if damage exists.

Checking the Package Contents

An MV 4440 is shipped with individually packaged vPODs. After the vPODs are installed in the MV 4440 chassis, the unit is ready to be connected to a 4Gb Fibre Channel interface of your video edit computer equipment.

The MV 4440 is shipped with the components and cables indicated in Table 3-1. Make sure that all components are included in the shipping carton. Notify your supervisor if components are missing.

TABLE 3-1. Components Shipped with the MV 4440.

Description	Quantity
4Gb Fibre Channel External Disk Storage Array	1
vPOD disk drive and RAID controller modules (each containing 1 RAID controller and 10 pre-installed, 2.5-inch disk drives)	up to 4
Power module	1
SFP (Small Form-factor Pluggable) optical LC Duplex transceiver modules	1 per vPOD
LC to LC Duplex optical cables	1 per vPOD
Diagnostic cable	1 per vPOD
4Gb Fibre Channel Host Adapter, with optical LC Duplex transceiver (optional component - available only if ordered with the MV 4440).	1 per vPOD (typical)
AC power cord (North America usage only)	1
This MV 4440 User Manual	1

Inspection

Examine the MV 4440 for:

- Correct part number on the barcode sticker at the rear of the unit (i.e., that the MVxxxxxxxxxx and SNxxxxxxxxx numbers on the barcode stickers match the data on the MV 4440 invoice).
- Scratches, gouges, dents, or cracks in the enclosure.
- Cracked or loose handles and rack-mount ears and/or feet.
- Missing switches.
- Bent, scratched, or missing pins on the connectors.
- Rust, discoloration, or signs of corrosion or water, moisture, or chemical damage.
- Loose or missing screws.
- Ripped, illegible, or missing safety labels or stenciled lettering.
- Parts that rattle or slide around the inside of the unit, when the unit is lifted.

Chapter 4

Installation

In this chapter…

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Hardware Installation and Configuration

The MV 4440 is shipped in the configuration shown in Figure 4-1.

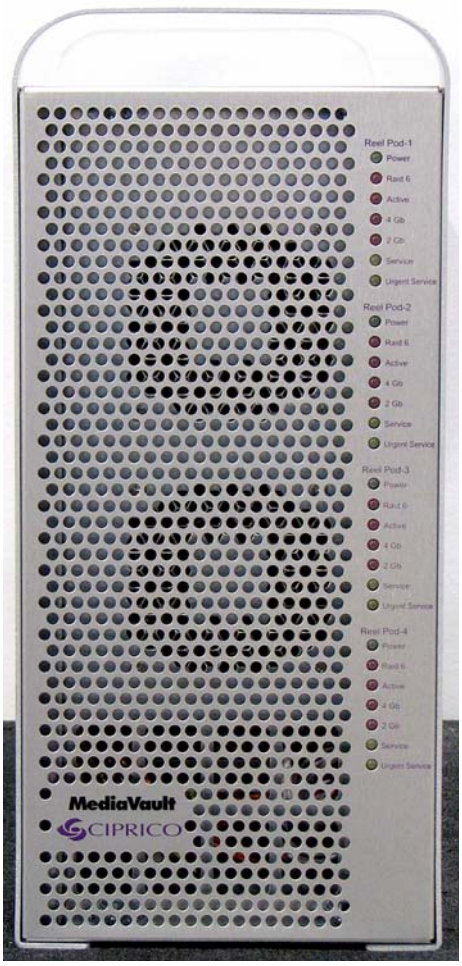

FIGURE 4-1. The MediaVault 4440.

Compatible Fibre Channel Host Adaptors

For the best and most reliable operation, use only optical cables and associated SFPs. Do not use copper cables.

TABLE 4-2. Compatible 2/4 Gigabit Fibre Channel Host Adaptors.

ATTO	Celerity series
Apple	Fibre Channel
Qlogic	QLE/QLA Series
LSI	Fibre Channel

The MV 4440 communicates with your computer by using a 4Gb Fibre Channel LC Duplex optical interface. A compatible host adaptor must be installed in your computer to work with the MV 4440 storage system.

To maximize the MV 4440's 4Gb Fibre Channel interface, the host adaptor in the computer should also be rated for 4Gb Fibre Channel. The 2Gb Fibre Channel host adaptors will work, but at a lower transfer rate.

Make sure the host adaptor is installed correctly, and that the appropriate host adapter drivers are installed and functioning properly, before connecting the MV 4440 to the computer system.

Fibre Channel Connections

The MV 4440 is shipped with a 4Gb Fibre Channel SFP (Small Form-factor Pluggable) optical transceiver, with an LC Duplex hookup on FC Port 1 or FC Port 2. The SFP mates to two LC Duplex optical cables for data transfer to and from the host computer, server, etc.

To Install the SFP and Connect the LC Duplex Optical Cable

1. Remove the protective cover from the SFP.
2. With the visible part of the copper circuit board connector facing down, insert the SFP into FC Port 2 or FC Port 1. Gently push the SFP in until it clicks. See Figure 4-4.

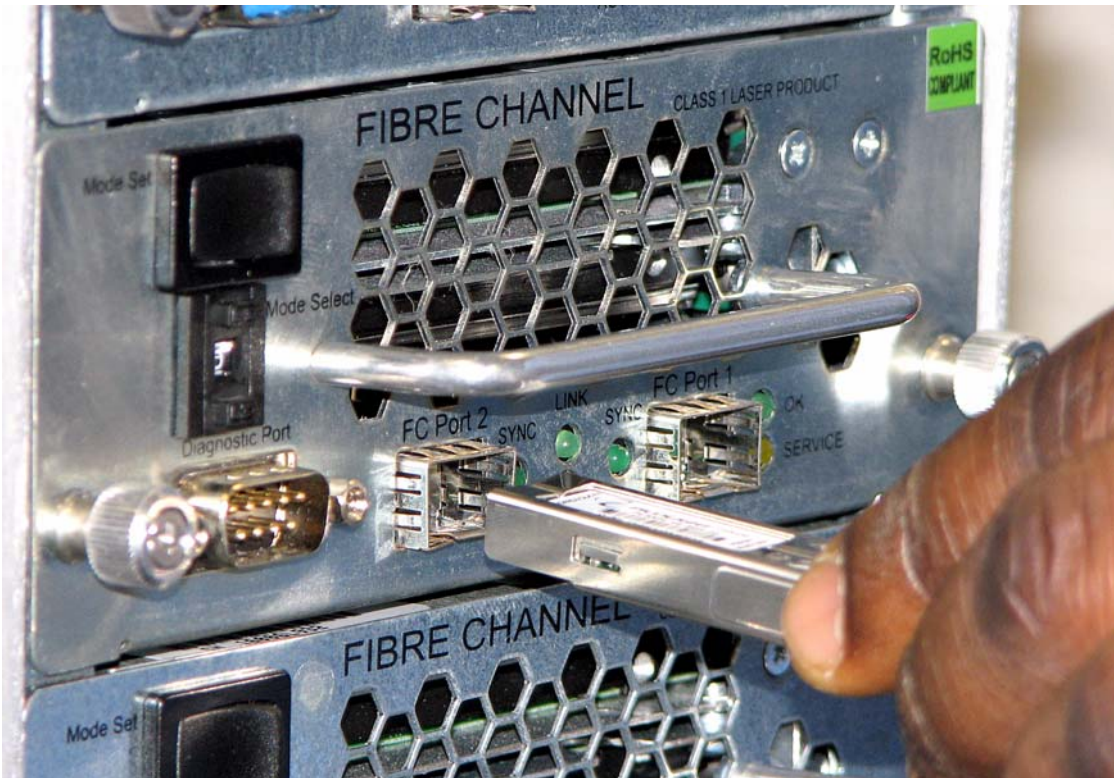

FIGURE 4-4. The SFP at FC Port 2.

3. The tips of the LC Duplex cable are packaged with a protective covering. (The protector might be caps over the white tips of the LC cable or a clipped-on shell). Remove the cover before use. See Figure 4-5.

FIGURE 4-5. The Tips of the LC Duplex Cable.

4. Insert one end of the LC Duplex cable into the SFP at FC Port 1 or FC Port 2. See Figure 4-6.

5. Insert the other end of the LC Duplex cable into the Fibre Channel switch or Fibre Channel host base adaptor of the host computer, server, etc.

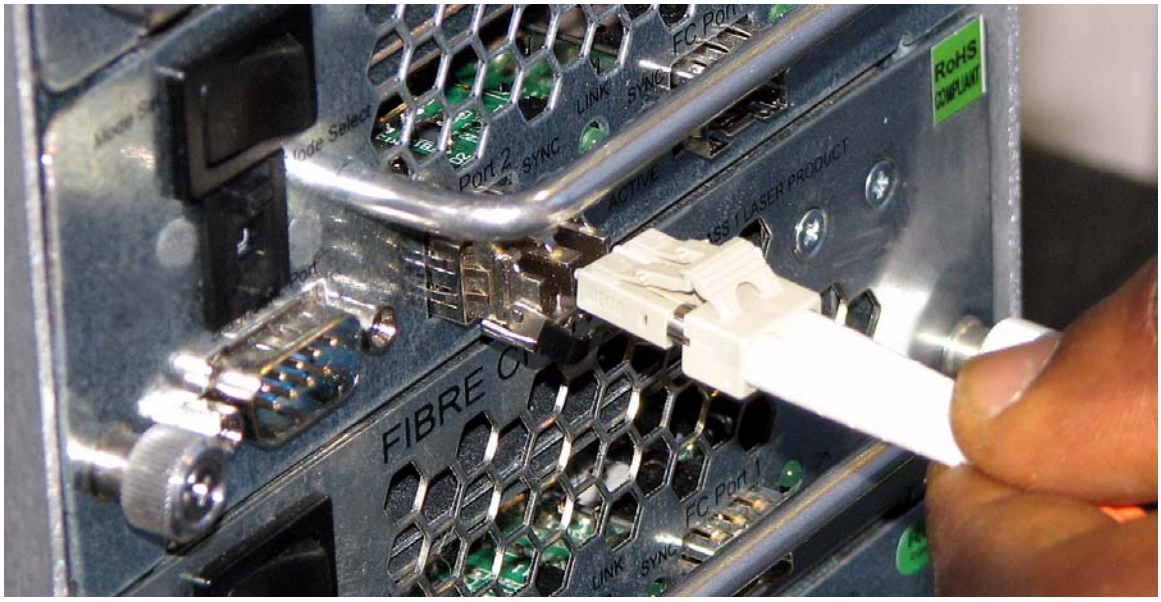

FIGURE 4-6. LC Duplex Cable Being Inserted into the SFP (at FC Port 2).

6. Repeat steps 1 through 5 for the other vPODs (if applicable).

NOTE: To remove the LC Duplex cable from the SFP, hold the release tab and pull out.

Daisy Chaining

MV 4440 units include a hub feature, which allows up to 4 vPODs to be daisy chained. The built-in hub LEDs are located between the two Fibre Channel ports, as shown in Figure 4-7.

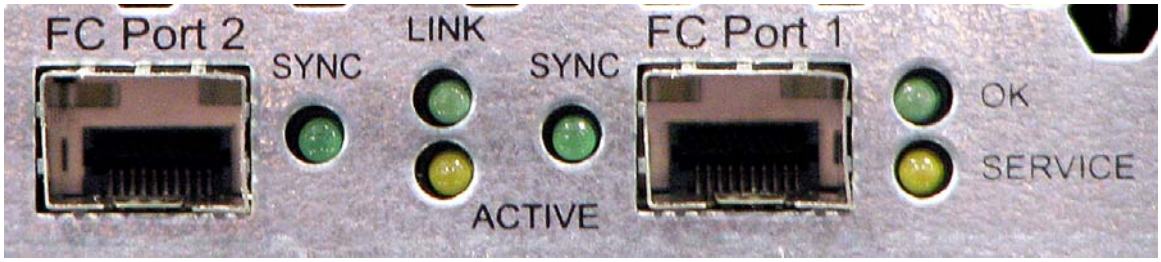

FIGURE 4-7. Built-In Hub, Showing the LEDs Located Between the Fibre Channels.

Hub Description

Table 4-3 describes the function of each hub LED. See Figure 4-7 for the location of the Fibre Channel ports and LEDs.

TABLE 4-3. Built-In Hub LEDs.

FC Port 1, FC Port 2	Fibre Channel 4 Gb SFP connection
LINK LED	FC communication established between the MediaVault controller and the built-in hub.
SYNC LED	A FC connection is established between the built-in hub portion of the MV 4440 and the device to which this port is connected.
ACTIVE LED	Data being transmitted to or from the Fibre Channel connector.

Connection Configurations

The MV 4440 can be attached either using the built-in hub feature or without using this feature. Various connection configurations are possible. Shown here are connections for four host adapters (or switches) to FC Port 2 of each vPOD (Figure 4-8); connections from vPODs 1 and 3 to a two-port host adapter (Figure 4-9); and four vPODs of an MV 4440 daisy-chained (Figure 4-10).

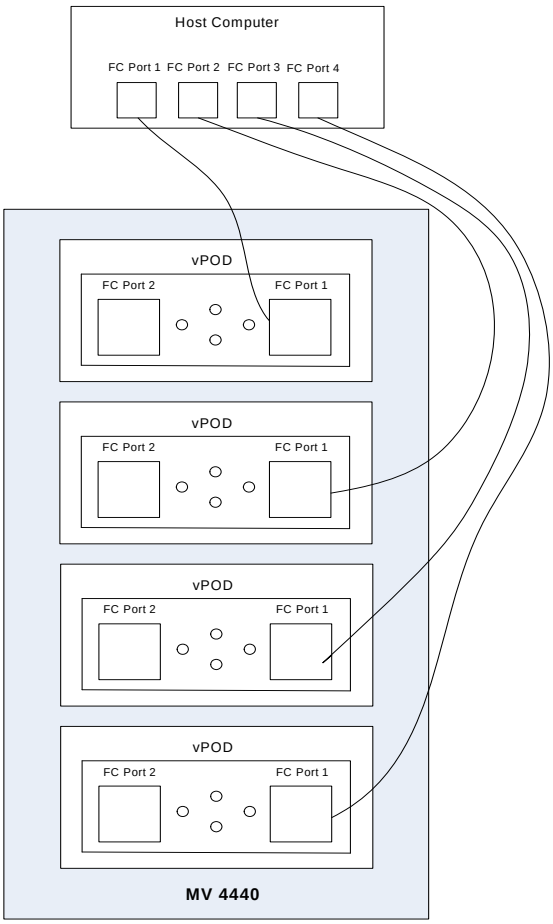

FIGURE 4-8. Connection Configuration with Cables from Each Port of a Host Adapter (or Switch) to FC Port 1 of Each vPOD.

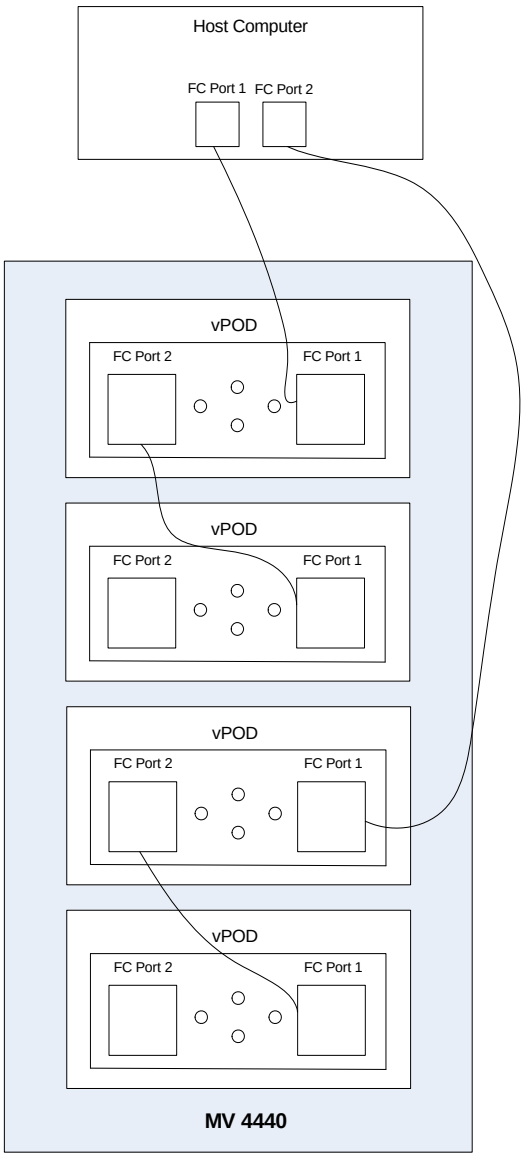

FIGURE 4-9. Connection Configuration That Daisy-Chains Multiple vPODs of an MV 4440, with a Dual-Channel Fibre Channel Host Adapter.

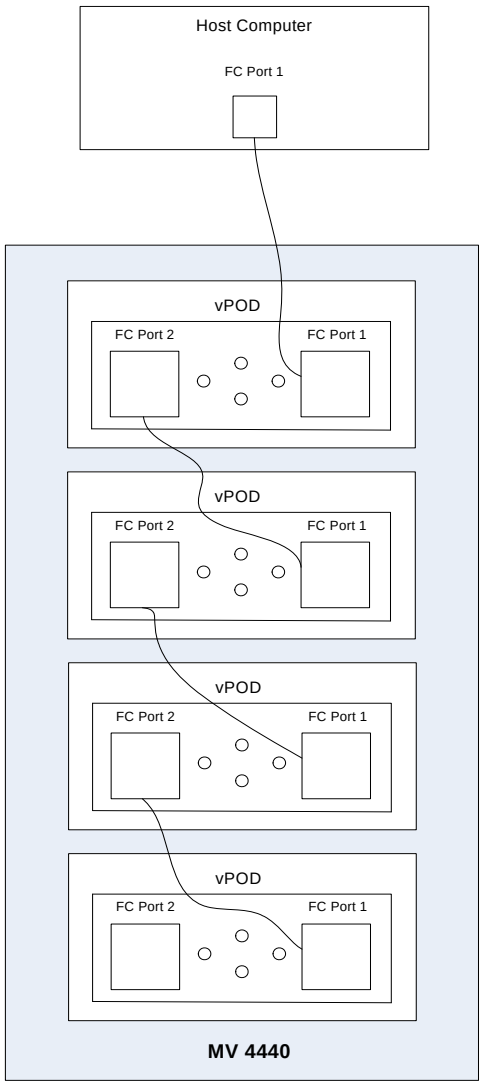

FIGURE 4-10. Connection Configuration, with Four vPODs Daisy Chained.

DIAG - Diagnostic Port

One serial diagnostic cable is supplied with each vPOD of an MV 4440 unit.

For information about MV 4440 diagnostics or firmware updates access the Ciprico Inc. knowledge base at http://kb.ciprico.com/lore/

Editing System Requirements

For video editing, the following video editing equipment, operating system, and video cards must be installed on your computer or connected to the computer or the MV 4440.

- 4Gb Fibre Channel Host Adapter with optical LC Duplex transceivers.
- Video Capture card.
- Video Editing software.
- Video player or other source of video input.

Fabric Switch Zoning

For a description of Fabric Switch Zoning techniques and examples, see Appendix E, *Fabric Switch Zoning*.

Hot-Swapping a vPOD

- For a description of how to hot-swap a vPOD while the MV4440 is powered-up, see Chapter 8, *Maintenance*.

Chapter 5

Operations

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Operational Functions

The operational functions for the MV 4440 are indicated on Table 5-1.

TABLE 5-1. Operational Functions for the MV 4440.

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Components

Front Panel Components

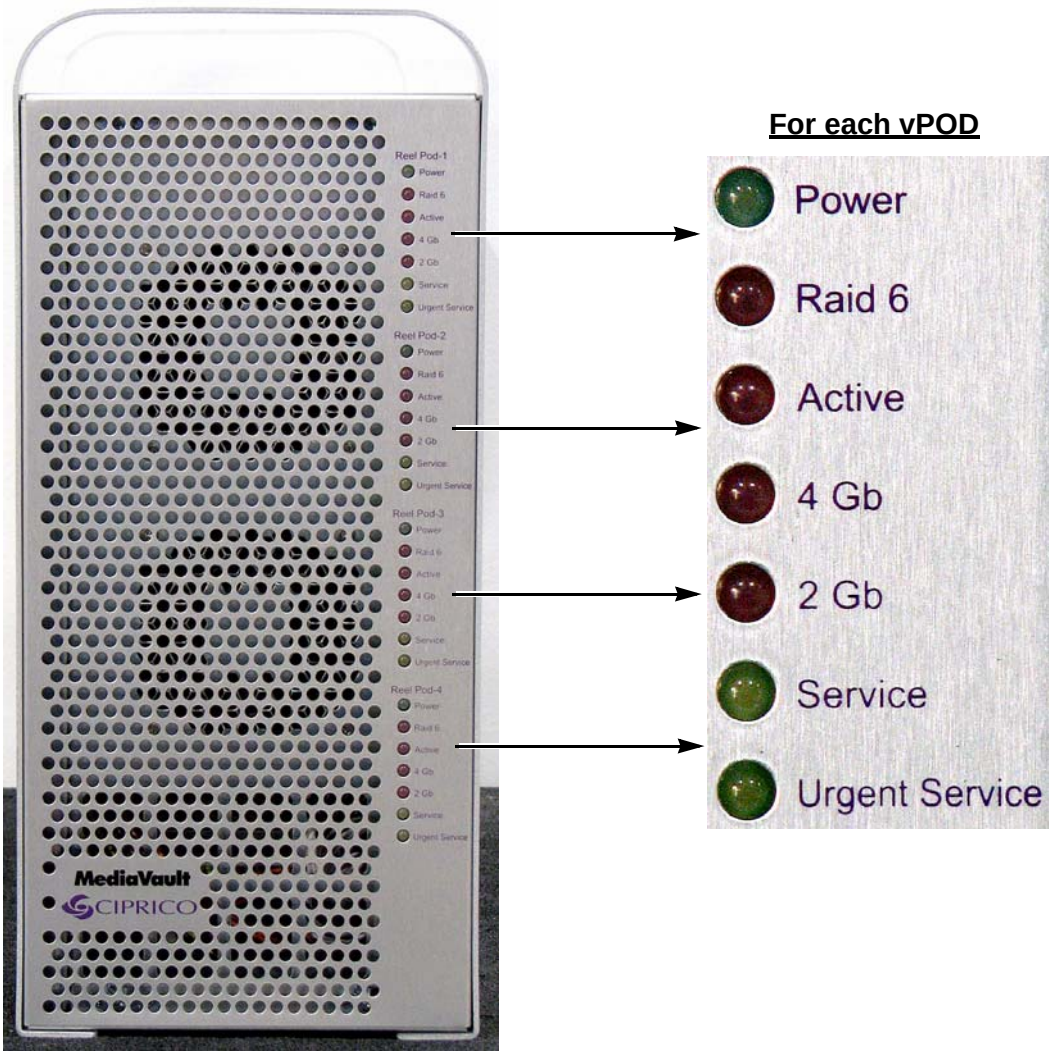

FIGURE 5-1. Front Components (for the four vPODs).

TABLE 5-2. Front Components of the MV 4440.

Component	Description
Power LED	"On" indicates that power is flowing to the vPOD.
RAID 6 LED	"On" indicates that the vPOD is operating in double-redundant RAID 6 mode. See the "Mode (RAID Type) Functions" section for additional RAID level information. When this indicator is off, the vPOD is operating in RAID 0 (performance) mode.
Active LED	An active LED will be on when data is being transmitted over the LC Duplex optical cables. The LED is not on when there is no data activity.
4 Gb LED	"On" indicates that the vPOD is operating at its optimum 4Gbit Fibre Channel speed. When this LED and the 2Gbit speed LED are off, the vPOD is operating at less than 2Gbit speed.
2 Gb LED	"On" indicates that the vPOD is operating in 2Gbit speed. When this LED and the 4Gbit speed LED are off, the vPOD is operating at less than 2Gbit speed.
Service LED	"On" indicates that at least one disk drive is marked down and vPOD will need service. There is one more drive left for redundancy. This LED blinks if the "Urgent Service" LED is also on.
Urgent Service LED	"On" indicates that at least two disk drives are marked down and need immediate service. No more drives remain for redundancy. If another drive fails data will be lost.

Rear Panel Components

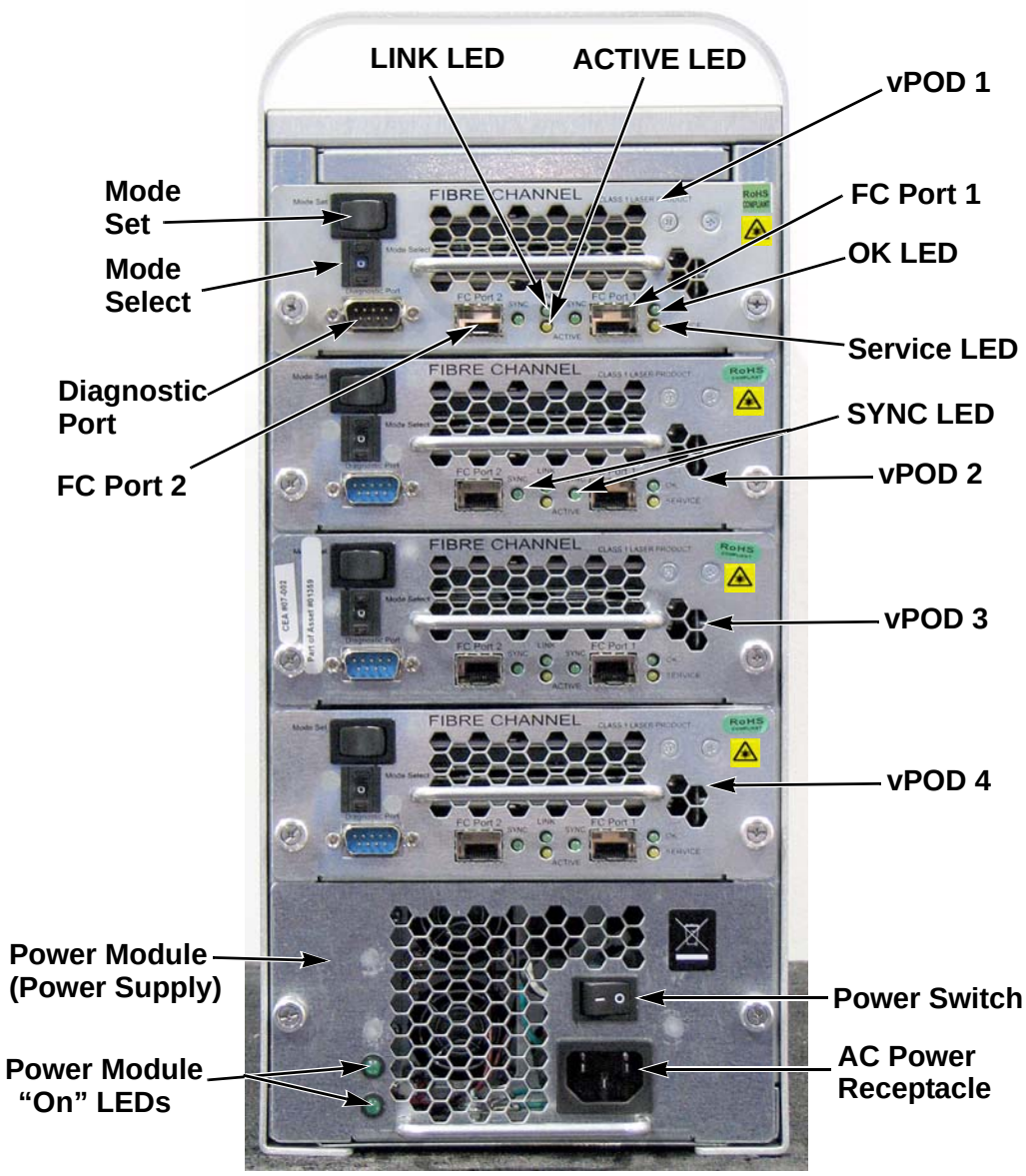

FIGURE 5-2. Rear Panel Components.

TABLE 5-3. Rear Components of the MV 4440.

Component	Description
LINK LED	A LINK LED is “on” when the Fibre Channel controller in the vPOD has established communications with the hub in the vPOD.
ACTIVE LED	An ACTIVE LED will be on when data is being transmitted over the LC Duplex optical cables. The LED is not on when there is no data activity.
vPOD	Each vPOD (4 per MV 4440) contains 1 RAID controller and 10 pre-installed, 2.5-inch disk drives.
FC Port 1, FC Port 2	FC Port 1 and FC Port 2 can accept a Fibre Channel SFP with an LC Duplex optical cable. See “Fibre Channel Connections” in Chapter 4, *Installation*.
OK LED	When “on” indicates that the controller in the vPOD is receiving power.
Service LED	When “on” indicates that one or more disk drives in the vPOD has been marked down and that the vPOD is in need of service.
SYNC LED	A SYNC LED is “on” when the Fibre Channel hub has established communications with the host computer or switch.
Power Switch	In the “On” (1) position, the power switch provides power to the entire MV 4440. In the “Off” (0) position, power is not provided to the power supplies. To completely remove power from the unit, disconnect the power cable from the AC power receptacle.
AC Power Receptacle	Allows an AC power cable to be connected to the power module.
Power Module “On” LEDs	The two LEDs are connected to the two power supplies inside the power module, one LED per power supply, and function as power status indicators. The upper LED indicates the power status for vPOD 1 and vPOD 2. The lower LED indicates the power status for vPOD 3 and vPOD 4. When the Power Switch is “on”, but one or both of the LEDs gone “off” it indicates that the power module has malfunctioned and needs service. NOTE: There is no audible alarm when this malfunction occurs.

TABLE 5-3. Rear Components of the MV 4440.

Component	Description
Power Module	The power module contains two power supplies. If one power supply malfunctions, the two vPODs it powers will not power-up. (The power load for the upper two vPODs is distributed across the upper power supply, and the power load for the lower two vPODs is distributed across the lower power supply). The power modules must be serviced by trained personnel only. Call Ciprico Inc. technical support department for additional instructions.
Diagnostic Port	The diagnostic port enables firmware downloads or perform special diagnostics to each vPOD. See "DIAG - Diagnostic Port" in Chapter 4, *Installation*.
Mode Select	Used to change the mode (RAID type) number. See the "Mode Change Procedure" on page 5-12.
Mode Set	Multi-function button. See the description in the "Mode Set Button" section on page 5-14.

Unit Power-Up Sequence

Always power-up the MV 4440 before powering-up the host computer. This allows the disk drive modules, and the data access/data transmission functions of the MV 4440, to be fully operational before the host computer is booted-up and “sees” the MV 4440 activities.

LED Power-On Sequence

The front panel LEDs of the MV 4440 power-up in the following sequence (per vPOD). Depending on the size of the drive, some LEDs might blink on momentarily, go off, then illuminate fully after a minute or so.

TABLE 5-4. LED Power-On Sequence, Each vPOD

1. All LEDs are briefly illuminated when the MV 4440 is powered-up.
2. POWER LED.
3. 4 Gb LED or 2 Gb LED (illuminates after host computer is powered-up. If MV 4440 is set to Auto or 1 Gb at power-up, the LED does not illuminate).
4. ACTIVE LED (blinks momentarily before illuminating fully).
5. RAID 6 LED (illuminated only if the vPOD is in RAID 6 when it is powered-up).
6. SERVICE LED (is illuminated only when 1 or more drives in a vPOD is malfunctioning)
7. URGENT SERVICE LED (is illuminated only when 2 or more drives in a vPOD are malfunctioning)

.

Mode (RAID Type) Functions

The MV 4440 allows you to choose the RAID type at which the unit will operate. In general, if you do not backup your data on a daily basis Ciprico Inc. recommends using the RAID 6 function.

TABLE 5-5. Mode Functions

Name	Mode*	Sector Size	Usable Capacity	Description and Advantages	If a Drive Fails...
RAID 0	0	512 bytes	Full	Used with all operating systems. There is full capacity for the array, but without any redundancy to protect your data. This mode stripes data across all 5 drives for the total capacity of the array	Data is lost.
RAID 6 @ 4K	1	4096 bytes	80%	Used with any system except: Avid (Macintosh or PC), Media 100 (Macintosh or PC), Video Toaster, SGI, Linux, or WIndows (when striping only). There is access to 80% of the total capacity with redundancy to protect your data. This mode stripes data across 8 drives, with 2 drives as parity drives for redundancy. This mode uses a 4096 sector size.	Data is preserved .
RAID 6 @ 512	2	512 bytes	80%	There is access to 80% of the total capacity with redundancy to protect your data. This mode stripes data across 8 drives, with 2 drives as parity drives for redundancy. This mode uses a 512 sector size.	Data is preserved
RAID 0 HD Turbo	3	512 bytes	80%	There is access to 80% of the total capacity without any redundancy to protect your data. This Turbo mode uses the highest data rate portions of the disk drives.	Data is lost

TABLE 5-5. Mode Functions

Name	Mode*	Sector Size	Usable Capacity	Description and Advantages	If a Drive Fails...
RAID 6 @ 4K HD Turbo	4	2048 bytes	40%	Uses the highest data rate portions of the disk drives.** There is access to 40% of the total capacity with redundancy to protect your data. This mode stripes data across 8 drives, with 2 drives as parity drives for redundancy. This mode uses a 4096 sector size and uses the higher data portion of the disk drives.	Data is preserved
RAID 6 @ 512 HD Turbo	5	512 bytes	40%	Uses the highest data rate portions of the disk drives.** There is access to 40% of the total capacity with redundancy to protect your data. This mode stripes data across 8 drives, with 2 drives as parity drives for redundancy. This mode uses a 512 sector size and uses the higher data portion of the disk drives.	Data is preserved
Wipe	6	This mode will start a write operation for all disk drives in the array. This function wipes out the first and last 256 sectors of an array. When the function is finished a series of 3 beeps is sounded.			
Diagnostic tests	7	The diagnostic tests are, in sequence: RAID 0 read test, RAID 0 write test, and read/write tests on individual drives. The cycle is repeated until stopped by the user.			
RAID 6 @ 512	8	512 bytes	80%	Reserved for future use.	Data is preserved
RAID 0 @4K	9	4096 bytes	100%	Reserved for future use.	Data is lost
Reserved	15	Reserved for future use.			

* Make sure to “double beep” to set the mode. See the “double beep” discussion on page 5-12.

** Data striped across eight drives, plus two drives for redundant information. Usable storage is the sum of eight drives.

Changing the Mode

Mode selection allows the MV 4440 operator to choose the desired operating mode for the unit. See the mode selection choices at Table 5-5.

CAUTION: Changing the mode can cause any existing data to become unreadable or corrupted. Make sure that any data you want to keep is stored elsewhere before you change the mode.

CAUTION: Remove or delete any known partitions before changing the mode. This keeps the operating system from malfunctioning due to left-over file system information.

IMPORTANT: Consult the "RAID Compatibility" section in Appendix A, Specifications, to ensure proper operations.

Mode Change Procedure

To change the mode, perform the following.

1. Turn off the computer.
2. Select a mode.
3. Set the mode number at the **MODE SELECT** switch, located at the rear of the MV 4440. See Figure 5-3. Use a pointed object (such as a pen tip) to press the desired button at the **MODE SELECT** switch.

- Press the upper button to increase the mode number.
- Press the lower button to decrease the mode number.

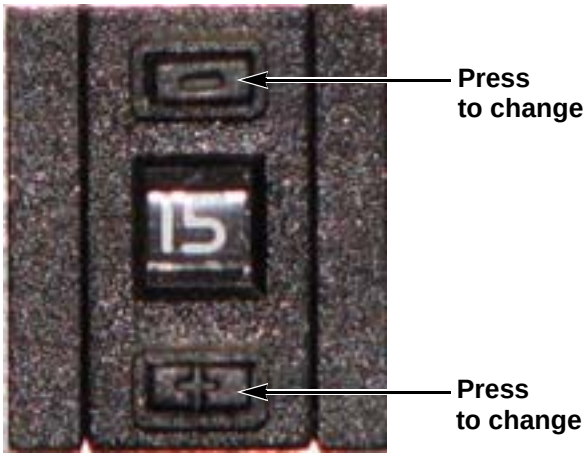

FIGURE 5-3. Mode Select Buttons.

4. Turn off power to the MV 4440.
5. Press and hold the **MODE SET** button (see a description of the button on page 5-14)
6. Apply power to the MV 4440.
7. Keeping holding down the **MODE SET** button until two beeps are heard to confirm the mode change.
8. Release the **MODE SET** button.

Changing Modes When Hot-Plugging vPODs

In some cases the MV 4440 cannot be power-cycled, and the mode must be changed while the vPOD is hot-plugged. Perform the following procedure.

1. Select a mode.
2. Set the mode number with the **MODE SELECT** switch located on the vPOD. See Figure 5-3. Use a pointed object (such as pen tip) to press the desired button at the **MODE SELECT** switch.
3. Insert the vPOD into the MV 4440.
4. As soon as the OK LED illuminates, press and hold the **MODE SET** button (see a description of the button on page 5-14).
5. Keep holding down the **MODE SET** button until two beeps are heard.
6. Release the **MODE SET** button.

Mode Set Button

This is a multi-function button. It can be used to:

- Change the mode (RAID level).
- Mute the audible alarm.
- Start a rebuild process, if the MV 4440 is in RAID 6 mode.

TABLE 5-6. Mode Set Button Functions

Indicator	Description
Mode Set Button (for Mode changes)	Used during the mode change procedure (see page 5-12). Press and hold this switch and apply power to the MV 4440. A double beep confirms the mode change. Release the switch after the double beep. The new Mode selection is now set.
Mode Set Button (for drive rebuilds)	In RAID 6 mode, and when a drive is marked as "down," this switch is used to start the drive rebuild process. After the alarm has been muted, press and hold the Mode Set button until you hear two beeps. The rebuild process has now started. See the "Audible Alarm" section and the "vPOD Hot-Swap Procedure" (in Chapter 8, *Maintenance*) for additional information.

NOTE: If a drive has been marked as failed, the vPOD will not double-beep if a drive is marked as down, and the Mode Set button is held down while powering-up the unit.

However, to clear this mode anyway, change the mode to Mode 0, then back to the previous mode.

Audible Alarm

The MV 4440 sounds an alarm when there is a problem with a drive. Corrective actions should be applied to fix the problem.

TABLE 5-7. Description of the Audible Alarms.

3 Short and 3 Long Beeps	These beeps is normally associated with a Fibre Channel interface problem. Always turn on the MV 4440 first, then turn on the computer.
Slow Beeps	Ten or less slower beeps indicate a bad drive or an intermittent drive. The number of beeps indicates which drive is having problems. When operating in RAID 6 mode the MV 4440 is still available for normal operation without performance degradation, but the beeps indicate that a drive is down and the MV 4440 is running in a degraded RAID 6 state. If more than two drives fail data will be lost.
Constant, Solid Tone	This indicates that one or more drives are disabled in a vPOD. The “Service” LED should also be illuminated and blinking, if one drive is disabled. The “Urgent Service” LED should be illuminated and blinking if two drives are disabled. The drive (or drives) needs to be serviced. See the “vPOD Hot-Swap Procedure” in Chapter 8, *Maintenance*, for more information. Mute the alarm by pressing the **MODE SET** button once. Holding the Mode Set button until two beeps are heard starts the rebuild process.

Chapter 6

Configuration

In this chapter…

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Preparing a Single vPOD of the MV 4440 (Non-Striping) 6-6
Striping Two to Four vPODs of the MV 4440 6-11
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Setup Procedure for Unstriped or Striped Volumes 6-17
Procedure for Unstriped Volumes Only 6-23
Procedure for Striped Volumes Only 6-28

Formatting and Partitioning

Formatting and partitioning the MV 4440 is required, in order to prepare the unit for usage.

After the unit is physically connected to your computer, use the following sections as a guide to locate and execute the appropriate utility to format and partition the MV 4440.

Treat each vPOD as one, ordinary hard-drive when partitioning and formatting.

Install the appropriate driver for your host adapter.

NOTE: Drive capacity can vary, depending on drive size and mode of operation. In the illustrations in this chapter array sizes can vary.

Macintosh G4/G5 with OS X Partitioning/Formatting

Use the following configuration to get maximum speed from the MV 4440 with OS 10.x for video capturing/playback and editing.

Check and ensure you are using the latest recommended configuration for your Fibre Channel host adapter, video capture card and editing software. Update any software or drivers, as necessary.

Launching the Apple Disk Utility Program

1. Launch the Apple Disk Utility program. (The Disk Utility is located at Macintosh HD > Applications > Utilities.)
2. If the MV 4440 is unformatted, one or more warnings appear before the Apple Disk Utility program is launched. Click **INITIALIZE...**. See Figure 6-1.

FIGURE 6-1. Disk Insertion Warnings for an Unformatted MV 4440.

3. The *Apple Disk Utility* screen appears. In the example below, icons of the four “1.8 TB CIPRICO FC-R...” drives of the MV 4440 are shown in the left side. See Figure 6-2.

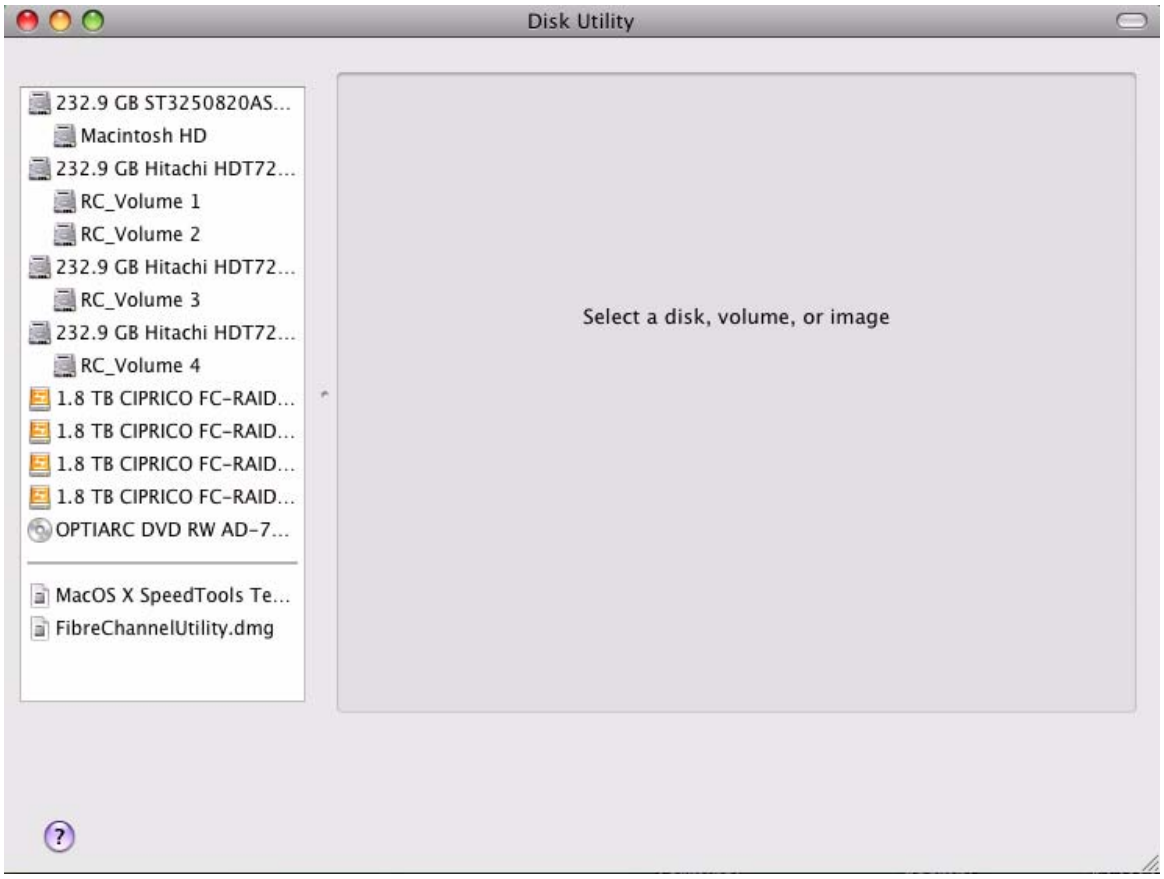

FIGURE 6-2. Apple Disk Utility Screen, Showing Four 1.8 TB Ciprico FC-RAID Drives.

4. Click on the upper CIPRICO FC-RAID icon. The screen changes, with the text of the “First Aid” tab displayed. See Figure 6-3.

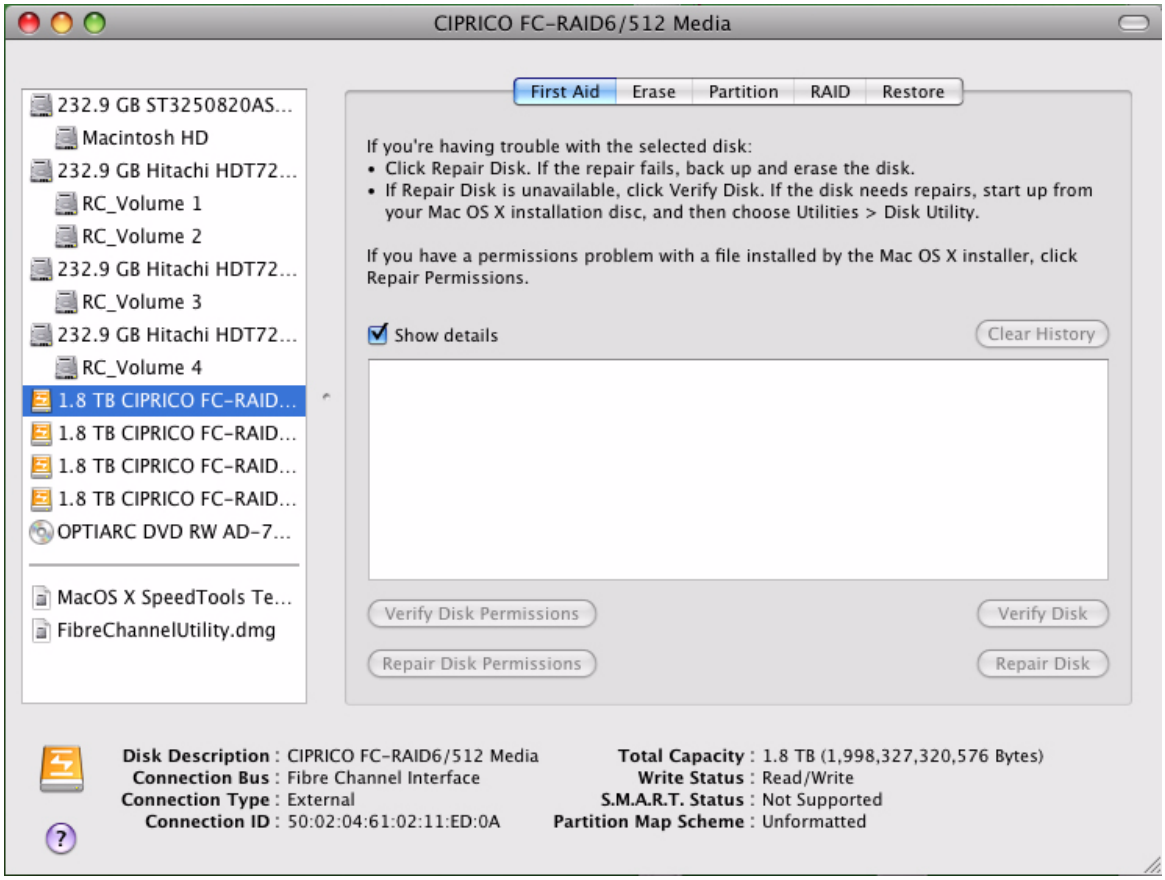
CIPRICO FC-RAID6/512 Media
232.9 GB ST3250820AS...
Macintosh HD
232.9 GB Hitachi HDT72...
RC_Volume 1
RC_Volume 2
232.9 GB Hitachi HDT72...
RC_Volume 3
232.9 GB Hitachi HDT72...
RC_Volume 4
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
OPTIARC DVD RW AD-7...
MacOS X SpeedTools Te...
FibreChannelUtility.dmg
First Aid
Erase
Partition
RAID
Restore
If you're having trouble with the selected disk:
• Click Repair Disk. If the repair fails, back up and erase the disk.
• If Repair Disk is unavailable, click Verify Disk. If the disk needs repairs, start up from your Mac OS X installation disc, and then choose Utilities > Disk Utility.
If you have a permissions problem with a file installed by the Mac OS X installer, click Repair Permissions.
Show details
Clear History
Verify Disk Permissions
Verify Disk
Repair Disk Permissions
Repair Disk
Disk Description : CIPRICO FC-RAID6/512 Media
Connection Bus : Fibre Channel Interface
Connection Type : External
Connection ID : 50:02:04:61:02:11:ED:0A
Total Capacity : 1.8 TB (1,998,327,320,576 Bytes)
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : Unformatted

FIGURE 6-3. The Apple Disk Utility Screen, Showing the Text After the Disk Icon is Clicked.

Preparing a Single vPOD of the MV 4440 (Non-Striping)

1. Click the “Partition” tab at the upper right of the *Apple Disk Utility* screen. See Figure 6-4.

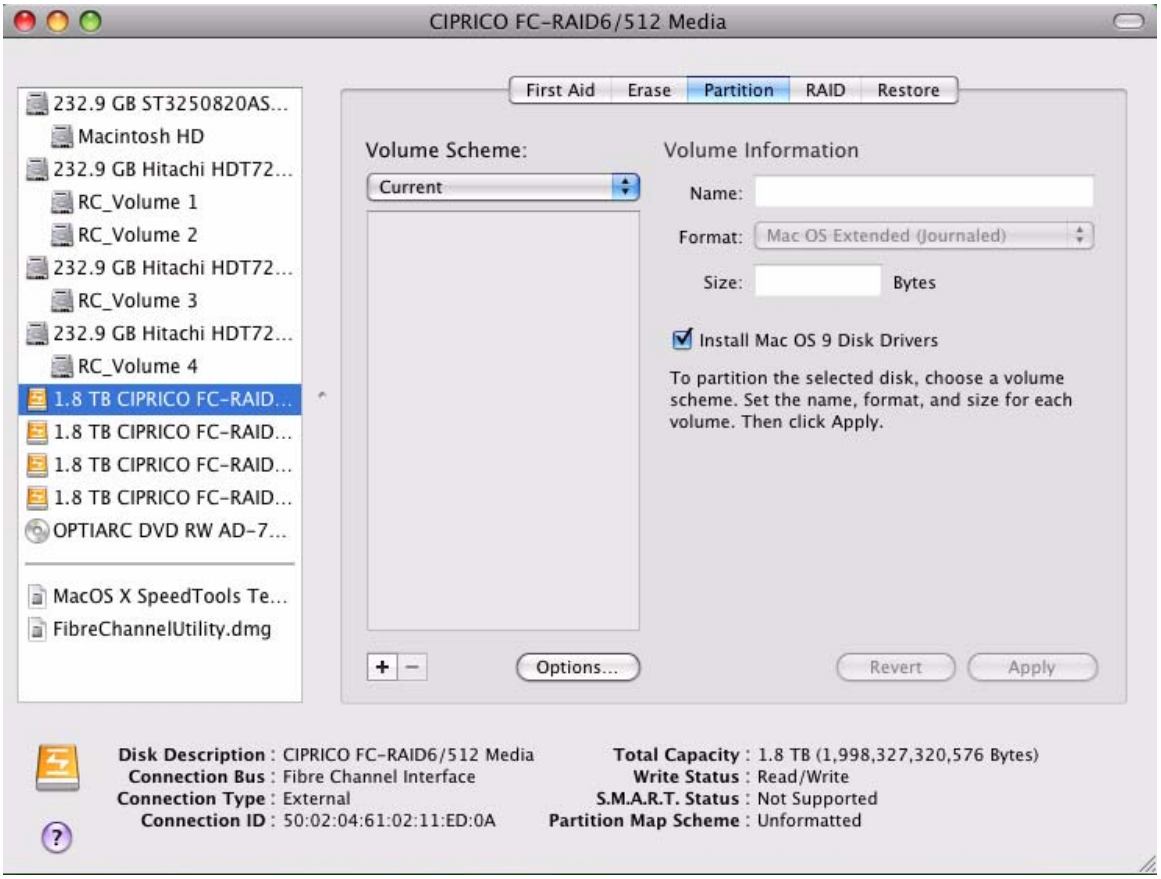

FIGURE 6-4. The Apple Disk Utility Screen, After the Partition Tab is Clicked.

2. At the “Volume Scheme:” field choose “1 partition”. See Figure 6-5.

IMPORTANT: Do not choose “Use Current”.

3. At the “Name:” field, under “Volume Information,” choose a name for the volume. See Figure 6-5.
4. In the “Format:” field, select “Mac OS Extended (Journaled)”. See Figure 6-5.

NOTE: For some versions of Mac OS/X, the screen contains a checkbox: “Install Mac OS 9 Disk Drivers”. Make sure to check this checkbox.

5. Click the **PARTITION** button at the lower section of the screen. See Figure 6-5.

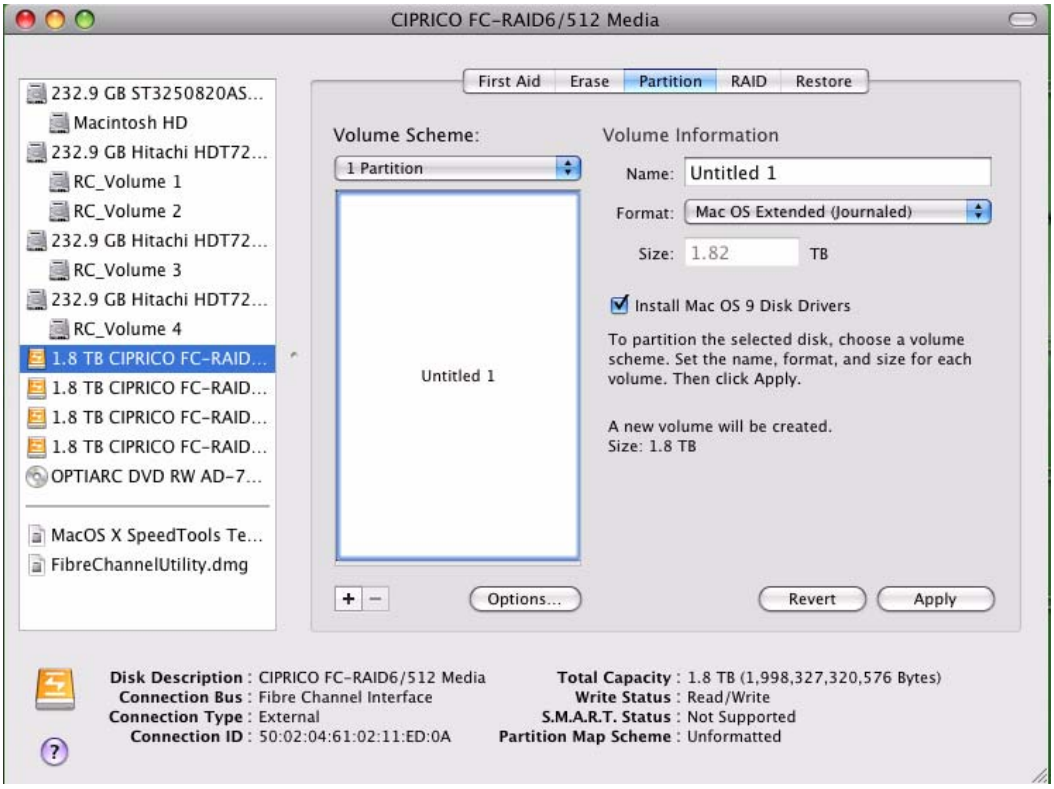

FIGURE 6-5. The Apple Disk Utility Screen, After Selections Are Made.

6. A *Partition Disk* screen appears. It warns about destroying data when partitioning a disk.To continue with the partition process, click the **PARTITION** button on this screen. See Figure 6-6.

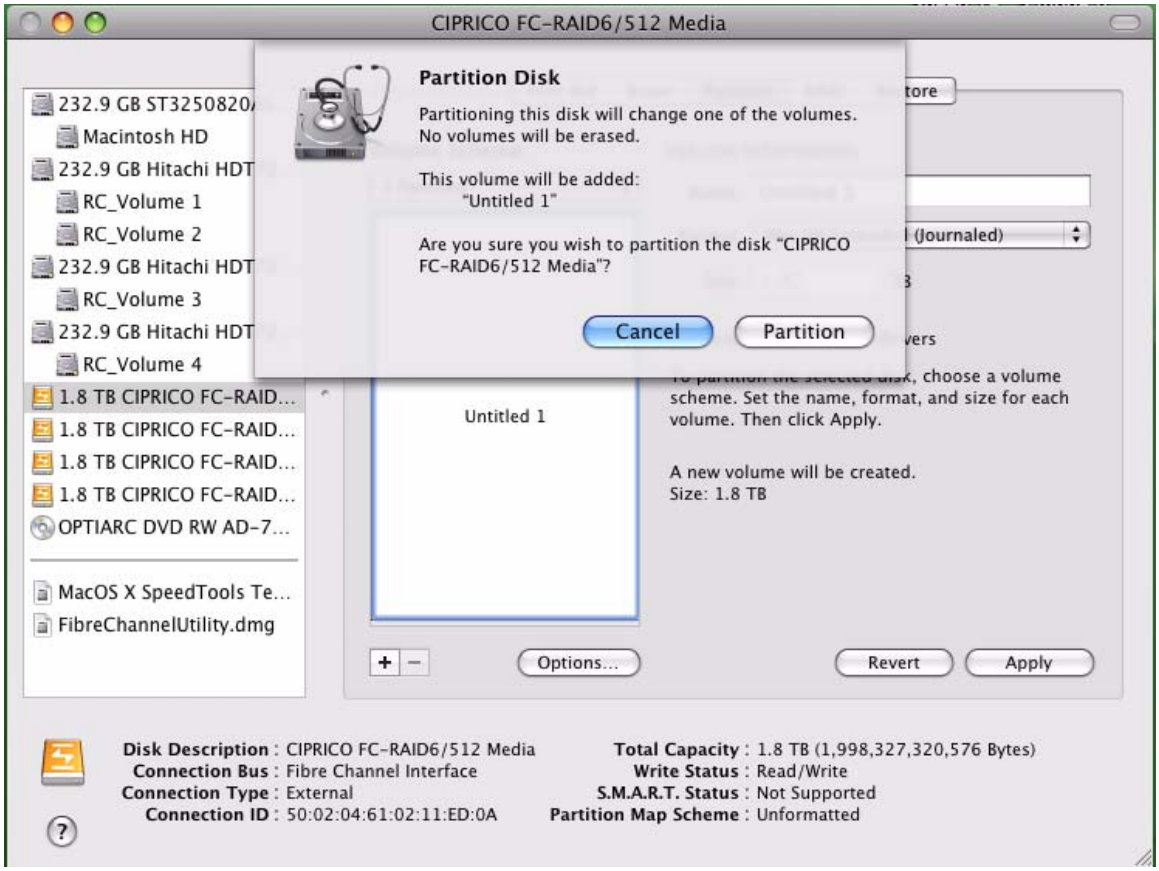
CIPRICO FC-RAID6/512 Media
Partition Disk
Partitioning this disk will change one of the volumes.
No volumes will be erased.
This volume will be added:
"Untitled 1"
Are you sure you wish to partition the disk "CIPRICO FC-RAID6/512 Media"?
Cancel
Partition
232.9 GB ST3250820
Macintosh HD
232.9 GB Hitachi HDT
RC_Volume 1
RC_Volume 2
232.9 GB Hitachi HDT
RC_Volume 3
232.9 GB Hitachi HDT
RC_Volume 4
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
OPTIARC DVD RW AD-7...
MacOS X SpeedTools Te...
FibreChannelUtility.dmg
Untitled 1
(Journaled)
choose a volume scheme. Set the name, format, and size for each volume. Then click Apply.
A new volume will be created.
Size: 1.8 TB
Options...
Revert
Apply
Disk Description : CIPRICO FC-RAID6/512 Media
Connection Bus : Fibre Channel Interface
Connection Type : External
Connection ID : 50:02:04:61:02:11:ED:0A
Total Capacity : 1.8 TB (1,998,327,320,576 Bytes)
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : Unformatted

FIGURE 6-6. Partition Disk Screen, Displayed Before the First Drive is Partitioned.

NOTE: Depending on system security, a dialog box might appear and require a system password.

NOTE: If OS 10.5.x is used, a dialog box might appear that inquires whether you want to use this device as a backup device for "Time Machine". Choose "No".

7. When the partition process is finished, the named disk appears at the left side of the *Apple Disk Utility* screen. See Figure 6-7.

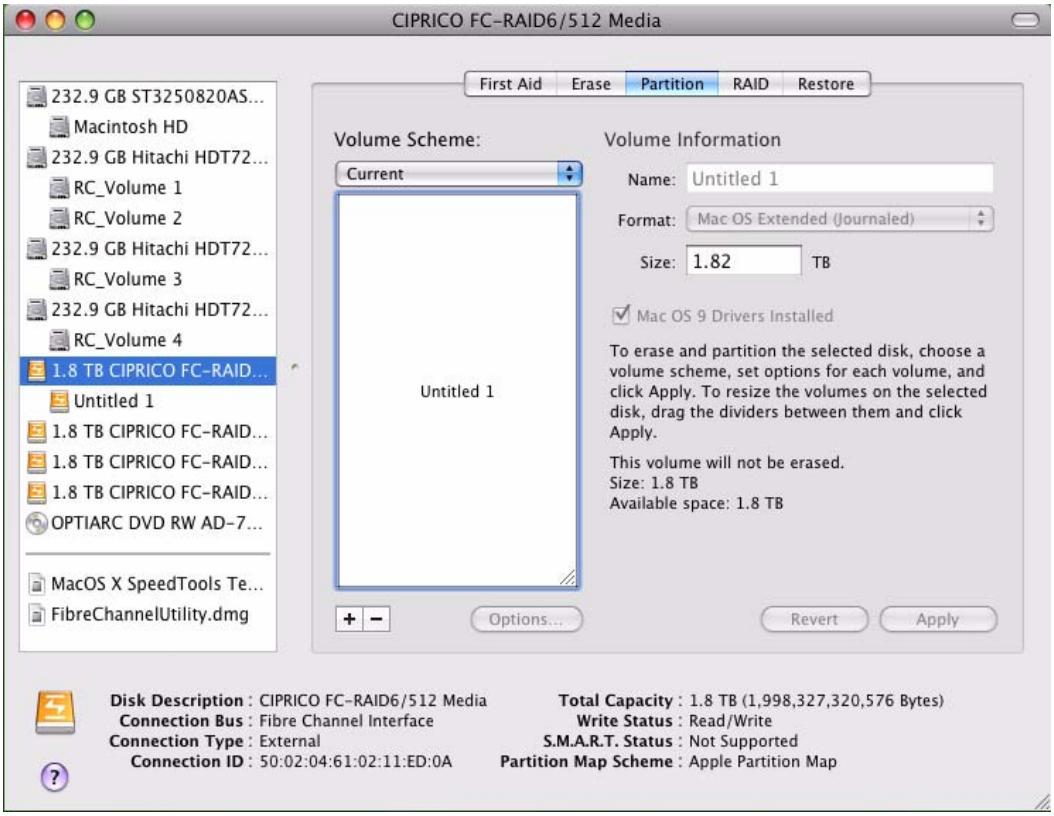

FIGURE 6-7. The Name of the Newly Partitioned Disk at the Apple Disk Utility Screen.

8. Repeat steps 1 through 7 three times, but make sure to choose a different volume name for each vPOD.

9. When the partition process is finished, the four named vPODs appear at the left side of the *Apple Disk Utility* screen. See Figure 6-8.

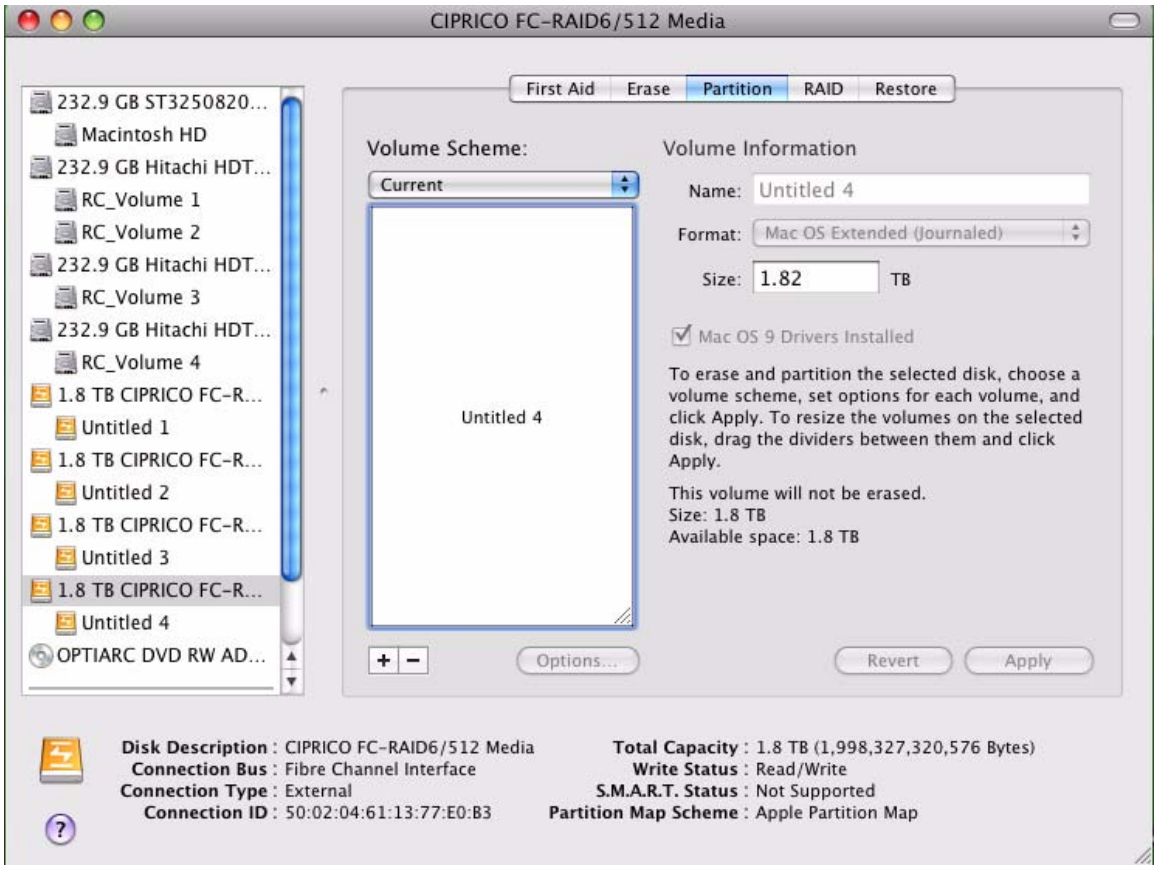

FIGURE 6-8. The Apple Disk Utility Screen, Showing Four Partitioned vPODs.

10. Close the *Apple Disk Utility* screen. The MV 4440 is ready for operations.

Striping Two to Four vPODs of the MV 4440

1. Launch the Apple Disk Utility program. (The Disk Utility is located at Macintosh HD > Applications > Utilities.)
2. If the MV 4440 has not previously been formatted, one or more warnings might appear before the Apple Disk Utility program is launched. Click **INITIALIZE...**. See Figure 6-9.

FIGURE 6-9. Disk Insertion Warnings for an Unformatted MV 4440 Unit.

3. The *Apple Disk Utility* screen appears. In the example below, icons of the four CIPRICO FC-RAID drives of the MV 4440 are shown in the left side. See Figure 6-10.
4. Click on the upper CIPRICO FC-RAID icon.

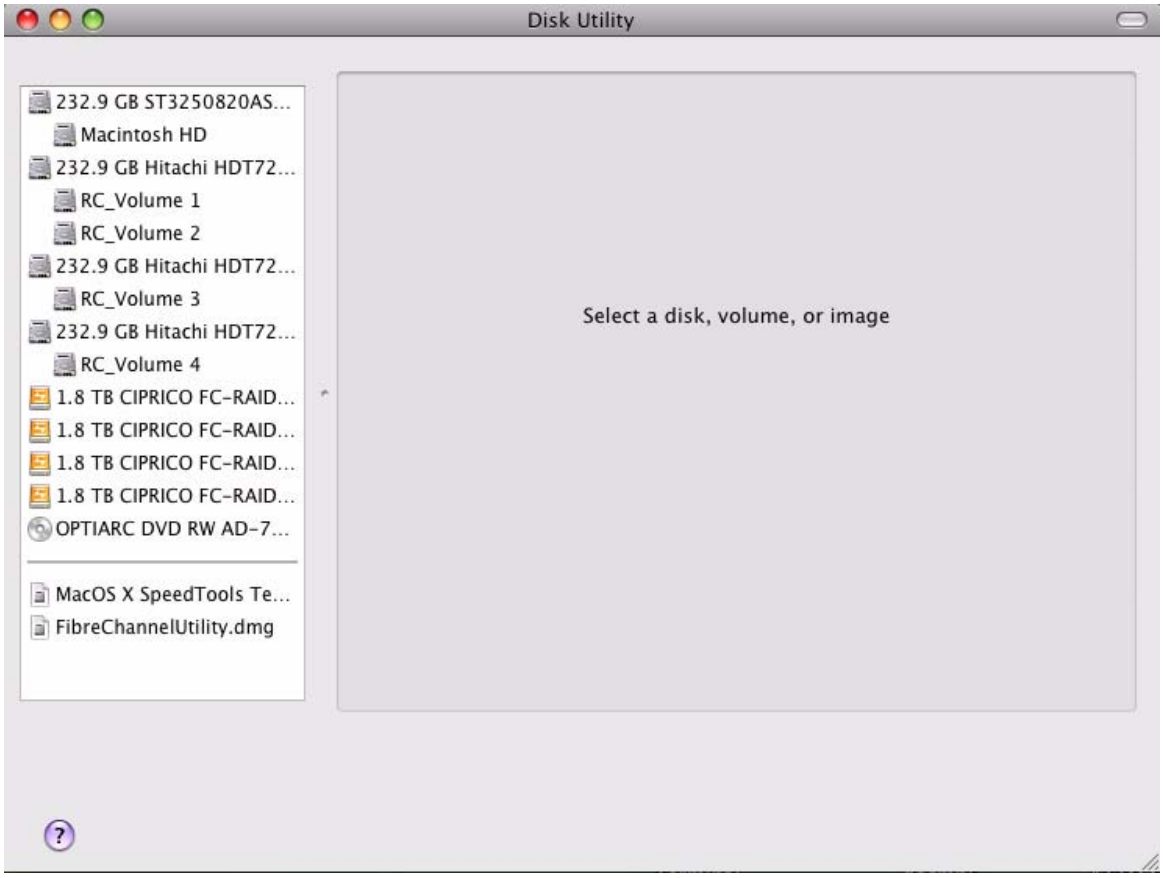

FIGURE 6-10. The Apple Disk Utility Screen, Prior to Clicking on the Upper Disk Icon.

5. Click on the “RAID” tab at the upper section of the screen. See Figure 6-11.

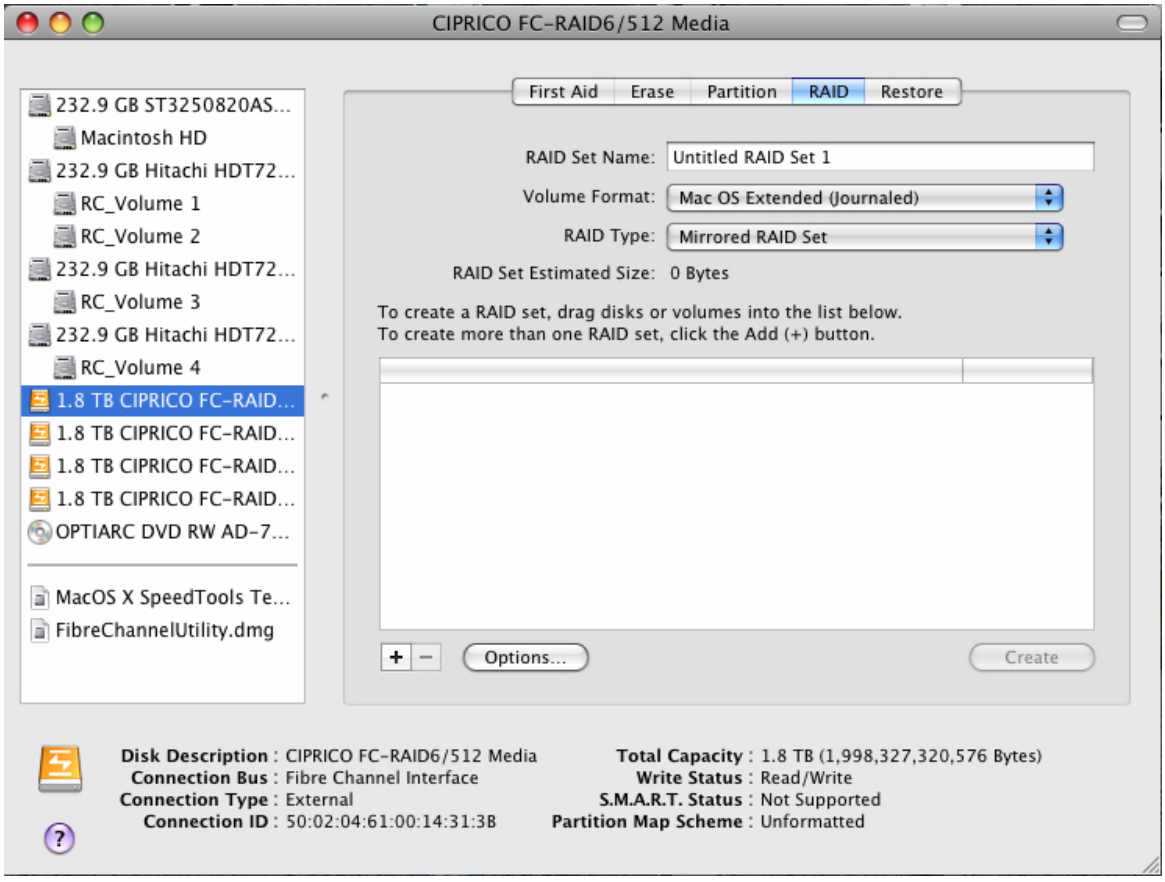
CIPRICO FC-RAID6/512 Media
232.9 GB ST3250820AS...
Macintosh HD
232.9 GB Hitachi HDT72...
RC_Volume 1
RC_Volume 2
232.9 GB Hitachi HDT72...
RC_Volume 3
232.9 GB Hitachi HDT72...
RC_Volume 4
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
1.8 TB CIPRICO FC-RAID...
OPTIARC DVD RW AD-7...
MacOS X SpeedTools Te...
FibreChannelUtility.dmg
First Aid
Erase
Partition
RAID
Restore
RAID Set Name: Untitled RAID Set 1
Volume Format: Mac OS Extended (Journaled)
RAID Type: Mirrored RAID Set
RAID Set Estimated Size: 0 Bytes
To create a RAID set, drag disks or volumes into the list below.
To create more than one RAID set, click the Add (+) button.
Options...
Create
Disk Description : CIPRICO FC-RAID6/512 Media
Connection Bus : Fibre Channel Interface
Connection Type : External
Connection ID : 50:02:04:61:00:14:31:3B
Total Capacity : 1.8 TB (1,998,327,320,576 Bytes)
Write Status : Read/Write
S.M.A.R.T. Status : Not Supported
Partition Map Scheme : Unformatted

FIGURE 6-11. The “RAID” Tab of the Apple Disk Utility Screen, Showing the Text After the Disk Icon is Clicked.

6. Drag the two or more CIPRICO FC-RAID icons to the middle section of the screen. See Figure 6-12.

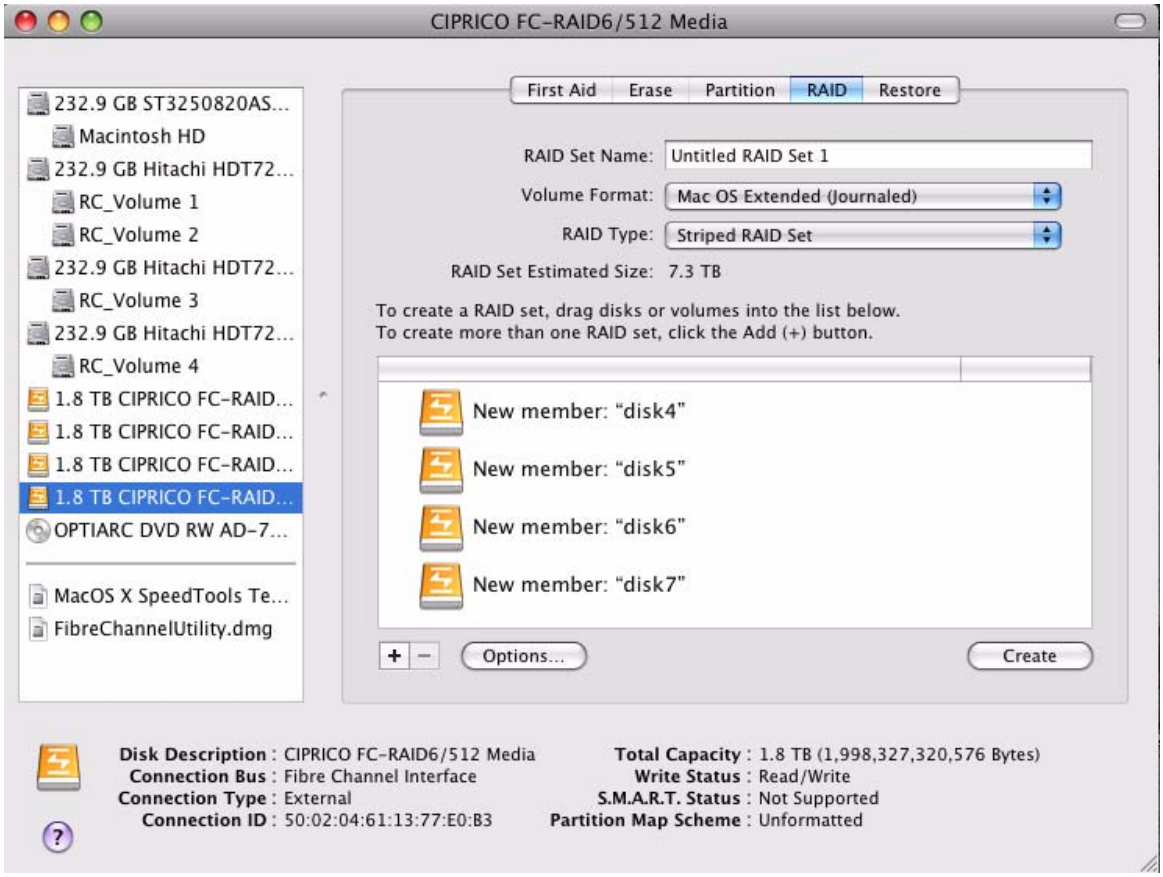

FIGURE 6-12. The Apple Disk Utility Screen, With Four RAID Icons in the Middle Section.

7. At the "RAID Set Name:" field, name the volume.
8. At the "Volume Format:" field, choose "Mac OS Extended (Journaled)".
9. At the "RAID Type:" field, choose "Striped RAID Set".
10. Click the **CREATE** button.

11. A *Creating RAID* screen appears. It warns about destroying data when a RAID set is created. To continue with creating the RAID, click the **PARTITION** button on this screen. See Figure 6-13.

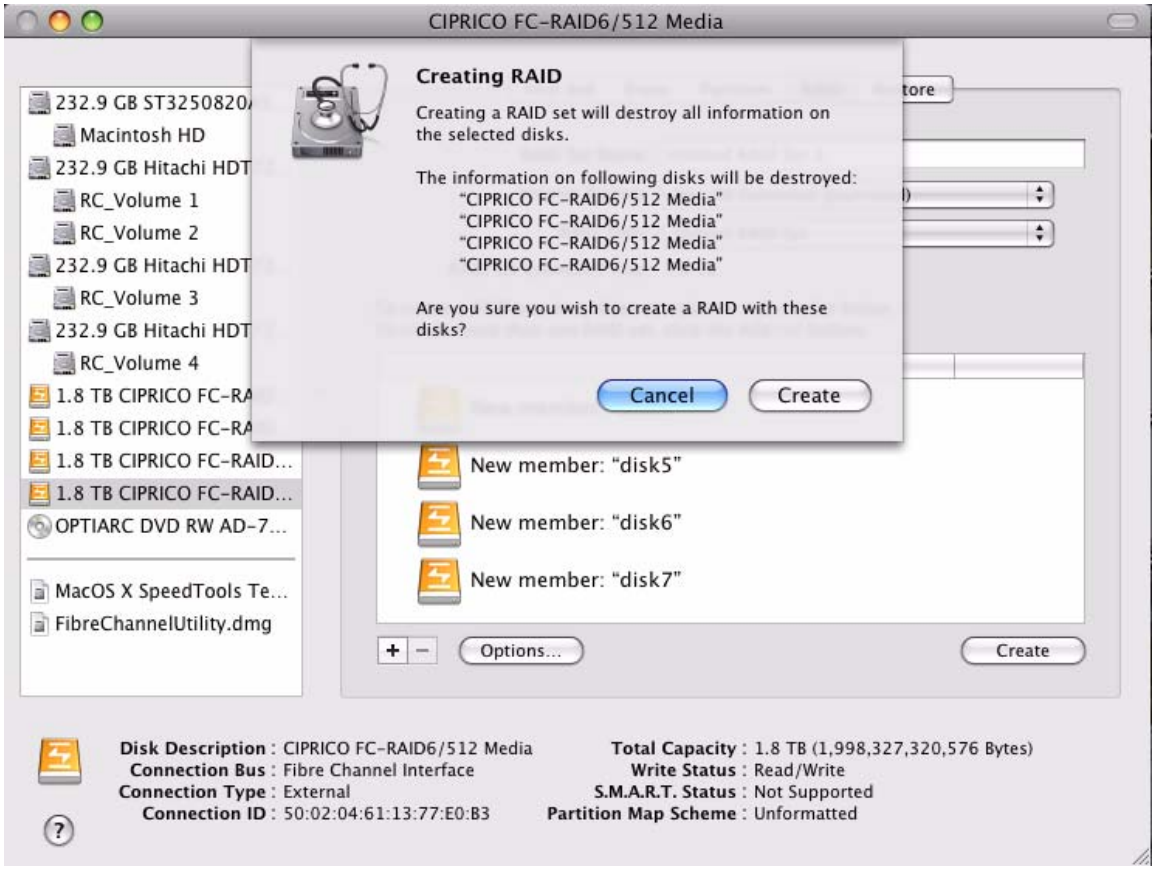

FIGURE 6-13. Creating RAID Warning Screen, Displayed Before a RAID Set is Created.

NOTE: If OS 10.5.x is used, a dialog box might appear that inquires whether you want to use this device as a backup device for "Time Machine". Choose "No".

12. When the creation process is finished, the *Apple Disk Utility* screen displays icons similar to the ones shown in this example. See Figure 6-14.

- The “1.8 TB CIPRICO FC-RAID...” icons represent the physical occurrences of the vPODs.
- The “RAID Slice” icon represents placeholders for the RAID set.
- The actual volume name is represented by “Untitled RAID Set 1”. It is shown below “7.3 TB Untitled RAID”, which represents the internal system name for the RAID set.
- At the center of the screen the “7.3 TB - “Untitled RA... 1 - Striped RAID Set” icon represents the volume on the RAID set.

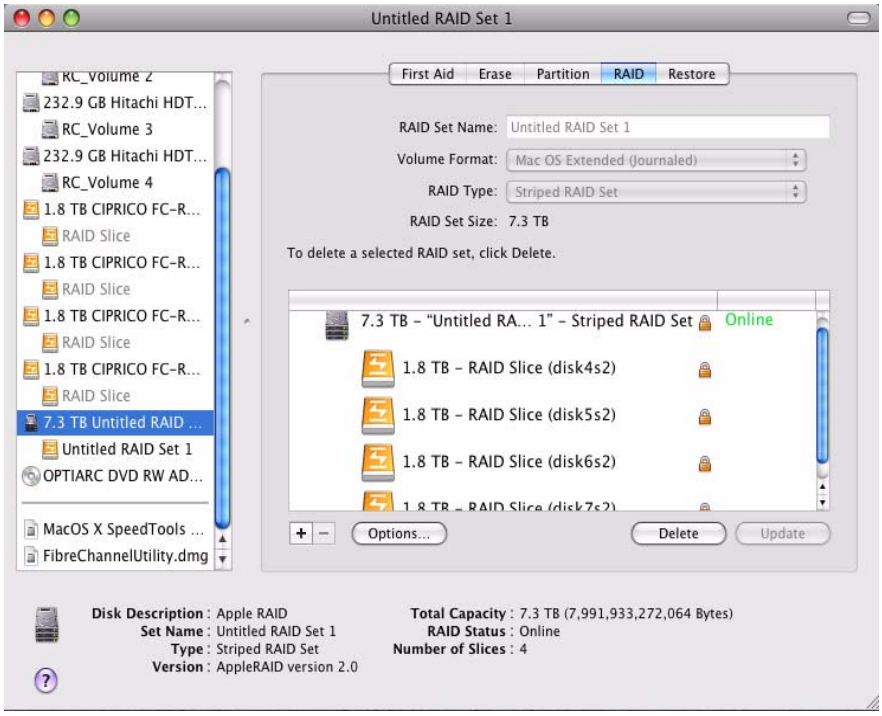
Untitled RAID Set 1
First Aid
Erase
Partition
RAID
Restore
RAID Set Name: Untitled RAID Set 1
Volume Format: Mac OS Extended (Journaled)
RAID Type: Striped RAID Set
RAID Set Size: 7.3 TB
To delete a selected RAID set, click Delete.
7.3 TB – “Untitled RA... 1” – Striped RAID Set
Online
1.8 TB – RAID Slice (disk4s2)
1.8 TB – RAID Slice (disk5s2)
1.8 TB – RAID Slice (disk6s2)
Options...
Delete
Update
232.9 GB Hitachi HDT...
RC_Volume 3
RC_Volume 4
1.8 TB CIPRICO FC-R...
RAID Slice
7.3 TB Untitled RAID ...
Untitled RAID Set 1
OPTIARC DVD RW AD...
MacOS X SpeedTools ...
FibreChannelUtility.dmg
Disk Description : Apple RAID
Set Name : Untitled RAID Set 1
Type : Striped RAID Set
Version : AppleRAID version 2.0
Total Capacity : 7.3 TB (7,991,933,272,064 Bytes)
RAID Status : Online
Number of Slices : 4

FIGURE 6-14. The Apple Disk Utility Screen, Showing the Striped RAID Set.

13. Close the *Apple Disk Utility* screen. The MV 4440 is ready for operations.

Windows 2000/2003/XP Partitioning/Formatting

Setup Procedure for Unstriped or Striped Volumes

NOTE: Steps 1 through 9 of this section describe a process that is common to unstriped and striped volumes. The process diverges after step 9. At that point, see "Procedure for Unstriped Volumes Only" on page 6-23 or "Procedure for Striped Volumes Only" on page 6-28.

1. After the computer boots-up, right-click on the "My Computer" icon on the desktop and select "Manage". Or, left-click on Start, then right-click on My Computer > Manage (for Windows XP or Windows 2003).
2. The *Computer Management* screen appears. Click "Disk Management" at the left side. See Figure 6-15.

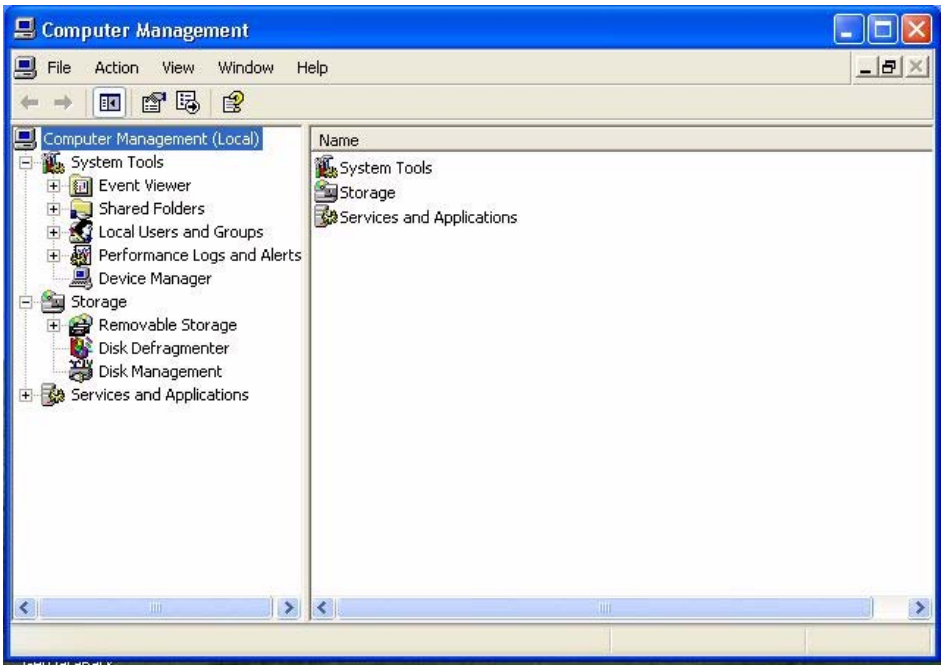

FIGURE 6-15. Computer Management Screen.

3. If this is the first time that the array has been used on the PC, the *Initialize and Convert Disk Wizard* screen appears. Click **NEXT >**. See Figure 6-16.

Initialize and Convert Disk Wizard
Welcome to the Initialize and Convert Disk Wizard
This wizard helps you to initialize new disks and to convert empty basic disks to dynamic disks.
You can use dynamic disks to create software-based RAID volumes that can be mirrored, or they can be striped or spanned across multiple disks. You can also expand single-disk and spanned volumes without having to restart the computer.
After you convert a disk to dynamic, you can only use Windows 2000 and later versions of Windows on any volume of that disk.
To continue, click Next.
< Back
Next >
Cancel

FIGURE 6-16. Initialize and Convert Disk Wizard Screen.

4. At the *Initialize and Convert Disk Wizard - Select Disks to Initialize* screen, make sure the Disk 1-Disk 4 checkboxes (as applicable, per the number of vPODs) are checked. Click **NEXT >**. See Figure 6-17.

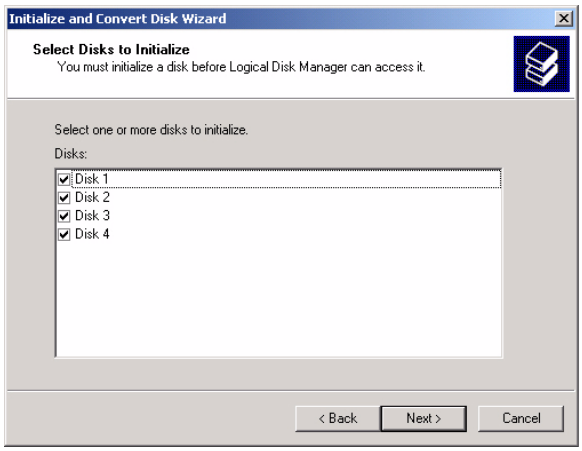

FIGURE 6-17. Initialize and Convert Disk Wizard - Select Disks to Initialize Screen.

5. At the *Initialize and Convert Disk Wizard - Select Disks to Convert* screen, check the Disk 1-Disk 4 checkboxes (as applicable, per the number of vPODs). Click **NEXT >**. See Figure 6-18.

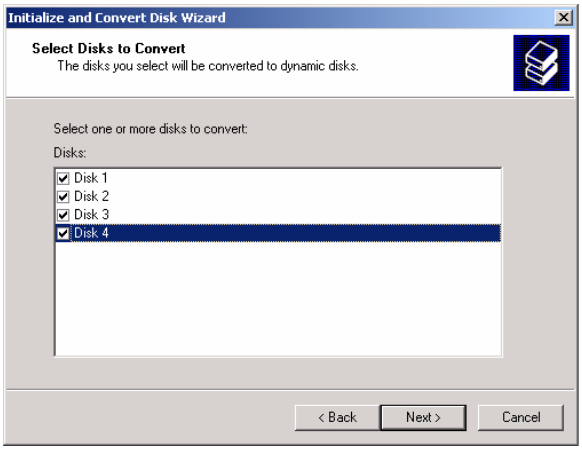

FIGURE 6-18. Initialize and Convert Disk Wizard - Select Disks to Convert Screen.

6. When the *Initialize and Convert Disk Wizard - Completing the Initialize and Convert Disk Wizard* screen appears, review the information. If it is OK, click **FINISH**. See Figure 6-19.

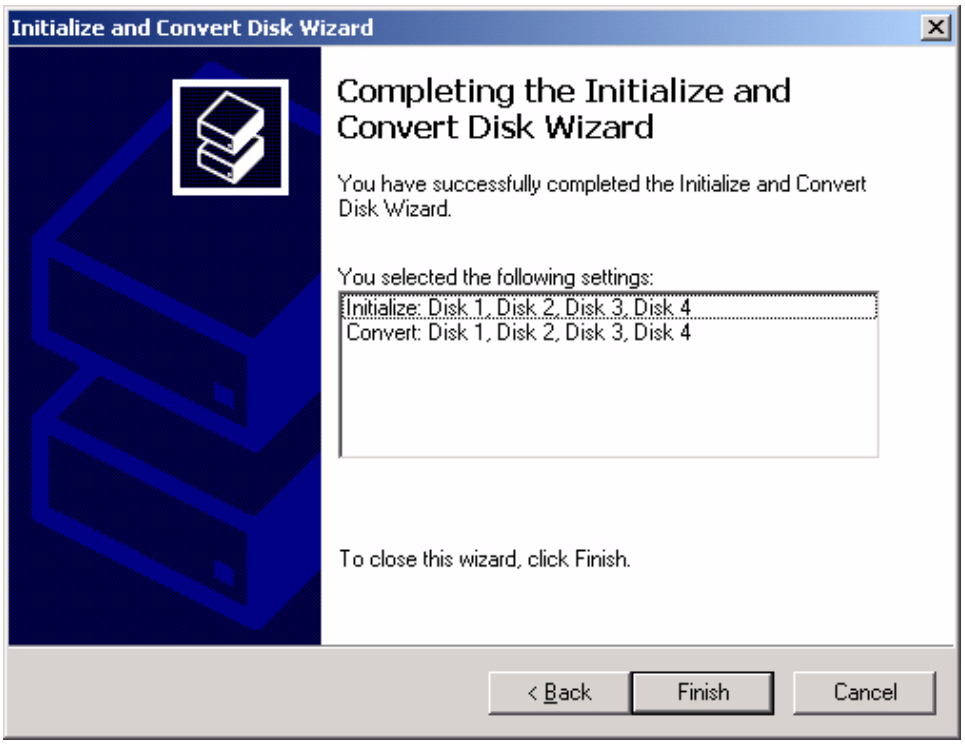
Initialize and Convert Disk Wizard
Completing the Initialize and Convert Disk Wizard
You have successfully completed the Initialize and Convert Disk Wizard.
You selected the following settings:
Initialize: Disk 1, Disk 2, Disk 3, Disk 4
Convert: Disk 1, Disk 2, Disk 3, Disk 4
To close this wizard, click Finish.
< Back
Finish
Cancel

FIGURE 6-19. Initialize and Convert Disk Wizard - Completing the Initialize and Convert Disk Wizard Screen.

7. The *Computer Management - Disk Management* screen appears. It shows Disk 1-Disk 4 (as applicable) as unallocated and each with 1397.31 GB (1.397 TB) of capacity. See Figure 6-20.

NOTE: Windows 2000 and Windows XP (32-bit) have limits of 2 TB per disk. If the data exceeds this limit, the disks will not appear in Disk Management.

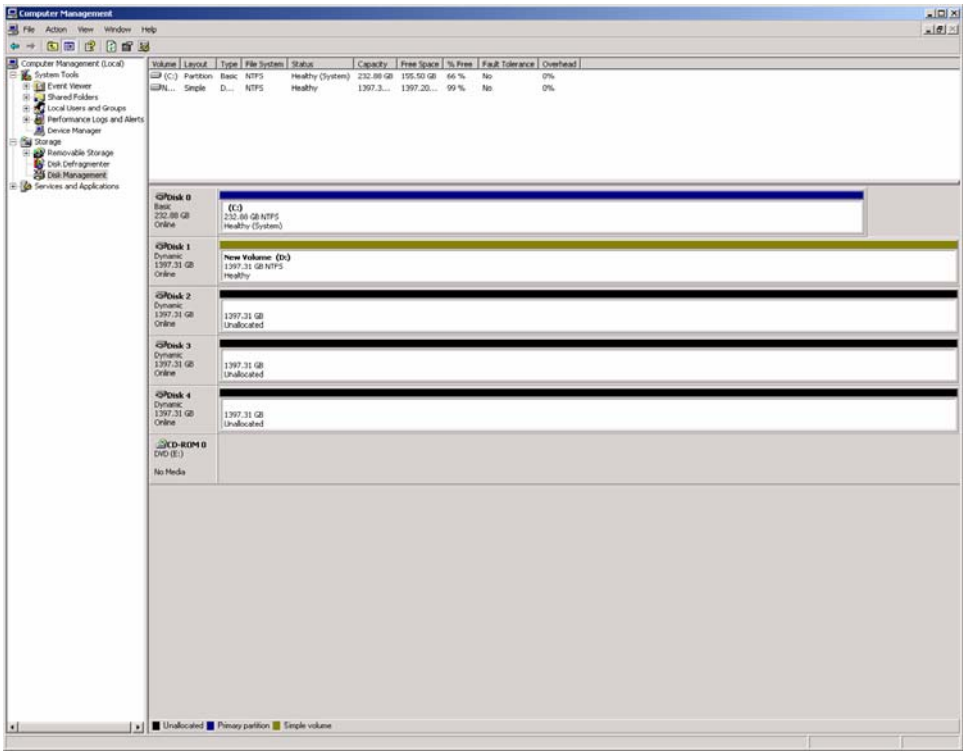

FIGURE 6-20. Computer Management - Disk Management Screen.

8. Right-click anywhere within the Disk 1 area, below the black bar, and select “New Volume...” in the pop-up menu. See Figure 6-21.

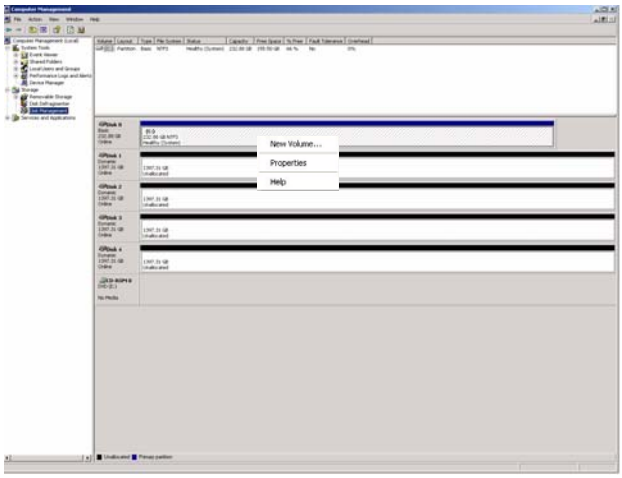

FIGURE 6-21. Computer Management Screen, Showing “New Volume...” Selected.

9. The *New Volume Wizard* screen appears. Click **NEXT**. See Figure 6-22.

New Volume Wizard
Welcome to the New Volume Wizard
This wizard helps you create volumes on dynamic disks.
A volume is a portion of one or more hard disk drives that is treated as a separate disk. You can format a volume with a file system. You gain access to a volume through a drive letter or mount point.
To continue, click Next.
< Back
Next >
Cancel

FIGURE 6-22. New Volume Wizard Screen.

Procedure for Unstriped Volumes Only

NOTE: As applicable, see the section entitled "Procedure for Striped Volumes Only" on page 6-28, to set-up striped volumes for the Windows operating system.

1. When the *New Volume Wizard - Select Volume Type* screen appears, set the "Volume Type" to "Simple". Click **NEXT >**. See Figure 6-23.

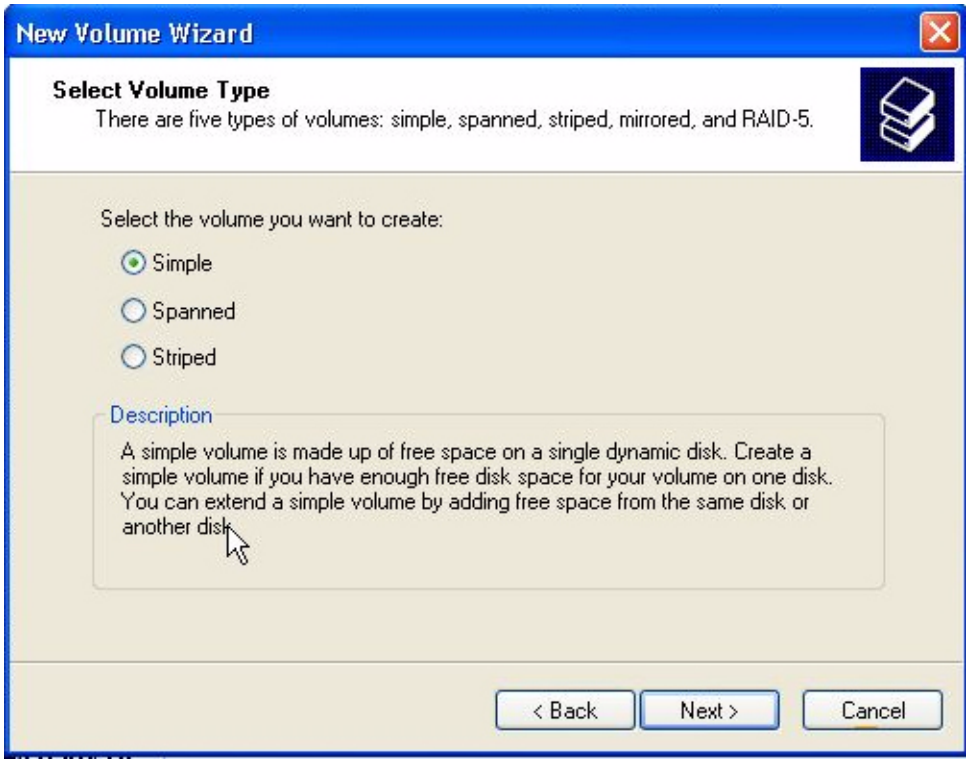
New Volume Wizard
Select Volume Type
There are five types of volumes: simple, spanned, striped, mirrored, and RAID-5.
Select the volume you want to create:
Simple
Spanned
Striped
Description
A simple volume is made up of free space on a single dynamic disk. Create a simple volume if you have enough free disk space for your volume on one disk. You can extend a simple volume by adding free space from the same disk or another disk.
< Back
Next >
Cancel

FIGURE 6-23. New Volume Wizard - Select Volume Type Screen.

2. The *New Volume Wizard - Select Disks* screen appears. Make sure that "Disk 1" is selected under "Selected:". Click **NEXT >**. See Figure 6-24.

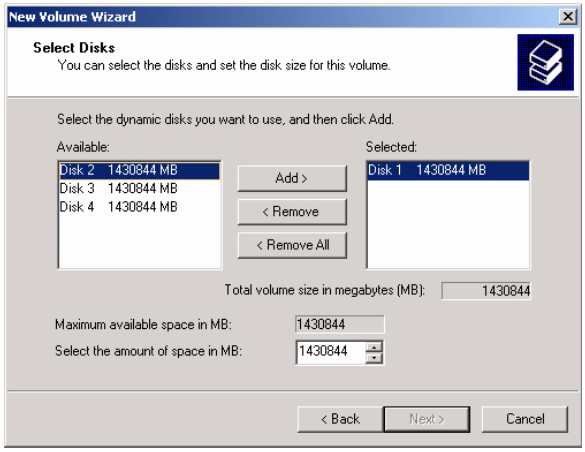
New Volume Wizard
Select Disks
You can select the disks and set the disk size for this volume.
Select the dynamic disks you want to use, and then click Add.
Available:
Disk 2 1430844 MB
Disk 3 1430844 MB
Disk 4 1430844 MB
Add >
< Remove
< Remove All
Selected:
Disk 1 1430844 MB
Total volume size in megabytes (MB): 1430844
Maximum available space in MB: 1430844
Select the amount of space in MB: 1430844
< Back
Next >
Cancel

FIGURE 6-24. New Volume Wizard - Select Disks Screen.

3. The *New Volume Wizard - Assign Drive Letter or Path* screen appears. Change the drive (array) letter, as desired. Click **NEXT >**. See Figure 6-25.

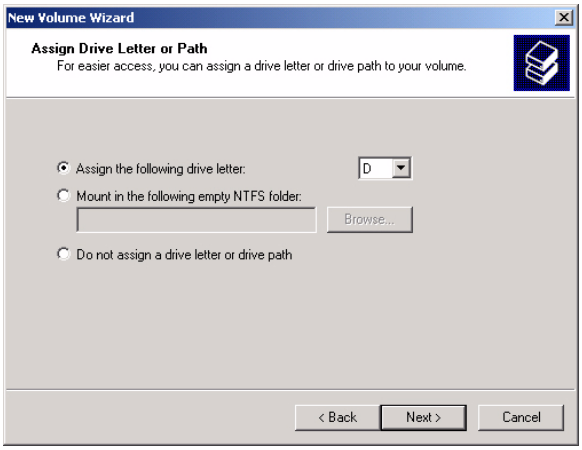
New Volume Wizard
Assign Drive Letter or Path
For easier access, you can assign a drive letter or drive path to your volume.
Assign the following drive letter: D
Mount in the following empty NTFS folder:
Browse...
Do not assign a drive letter or drive path
< Back
Next >
Cancel

FIGURE 6-25. New Volume Wizard - Assign Drive Letters or Path Screen.

4. The *New Volume Wizard - Volume Format* screen appears. As desired, change the “Volume label”. Make sure the “Perform a quick format” checkbox is checked. Click **NEXT >**. See Figure 6-26.

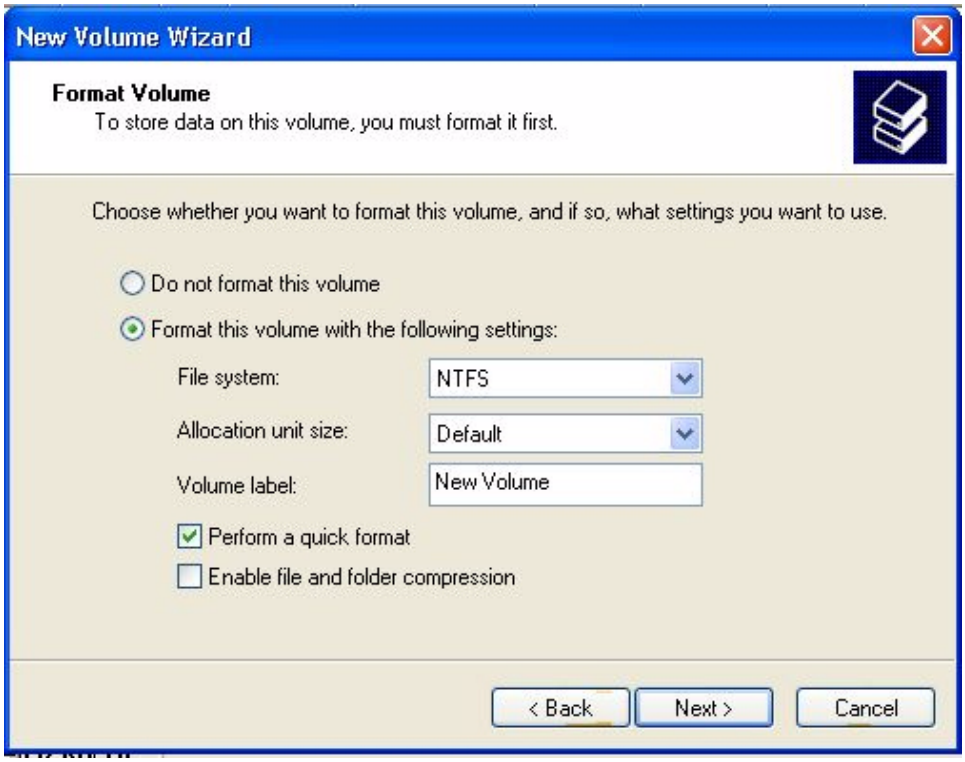
New Volume Wizard
Format Volume
To store data on this volume, you must format it first.
Choose whether you want to format this volume, and if so, what settings you want to use.
Do not format this volume
Format this volume with the following settings:
File system:
NTFS
Allocation unit size:
Default
Volume label:
New Volume
Perform a quick format
Enable file and folder compression
< Back
Next >
Cancel

FIGURE 6-26. New Volume Wizard - Format Volume Screen.

5. The *New Volume Wizard - Completing the New Volume Wizard* screen appears. Review the settings that have been made. If incorrect, click **< BACK** to make a correction at a previous screen. If OK, click **FINISH**. See Figure 6-27.

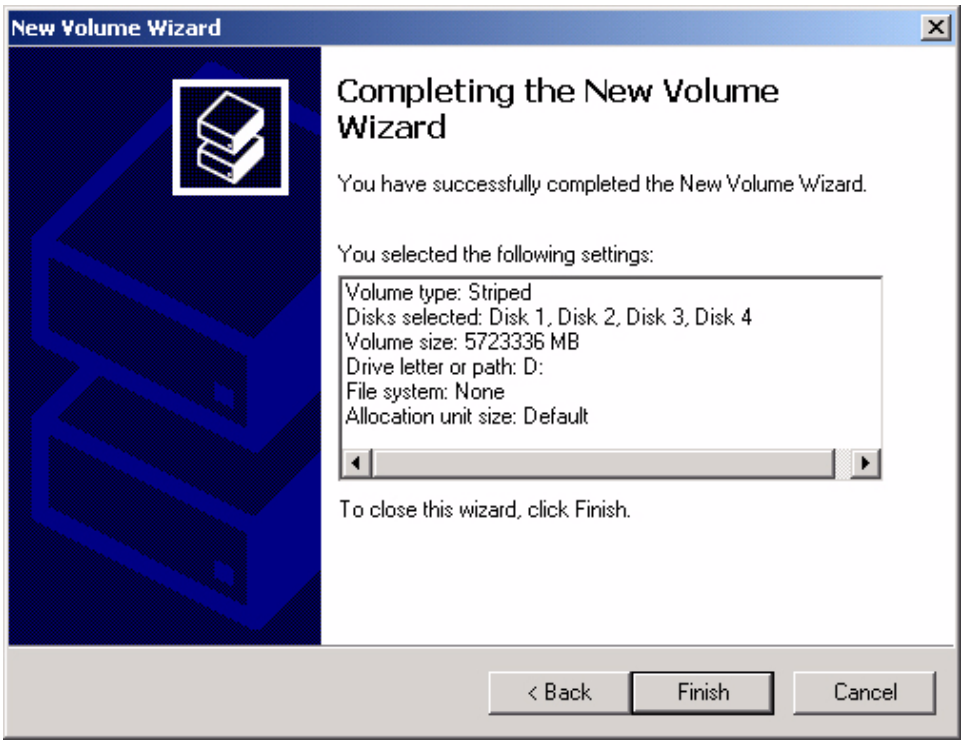
New Volume Wizard
Completing the New Volume Wizard
You have successfully completed the New Volume Wizard.
You selected the following settings:
Volume type: Striped
Disks selected: Disk 1, Disk 2, Disk 3, Disk 4
Volume size: 5723336 MB
Drive letter or path: D:
File system: None
Allocation unit size: Default
To close this wizard, click Finish.
< Back
Finish
Cancel

FIGURE 6-27. New Volume Wizard - Completing the New Volume Wizard Screen.

6. The *Computer Management* screen appears. It shows the settings of “New Volume (D:)” for Disk 1. See Figure 6-28.

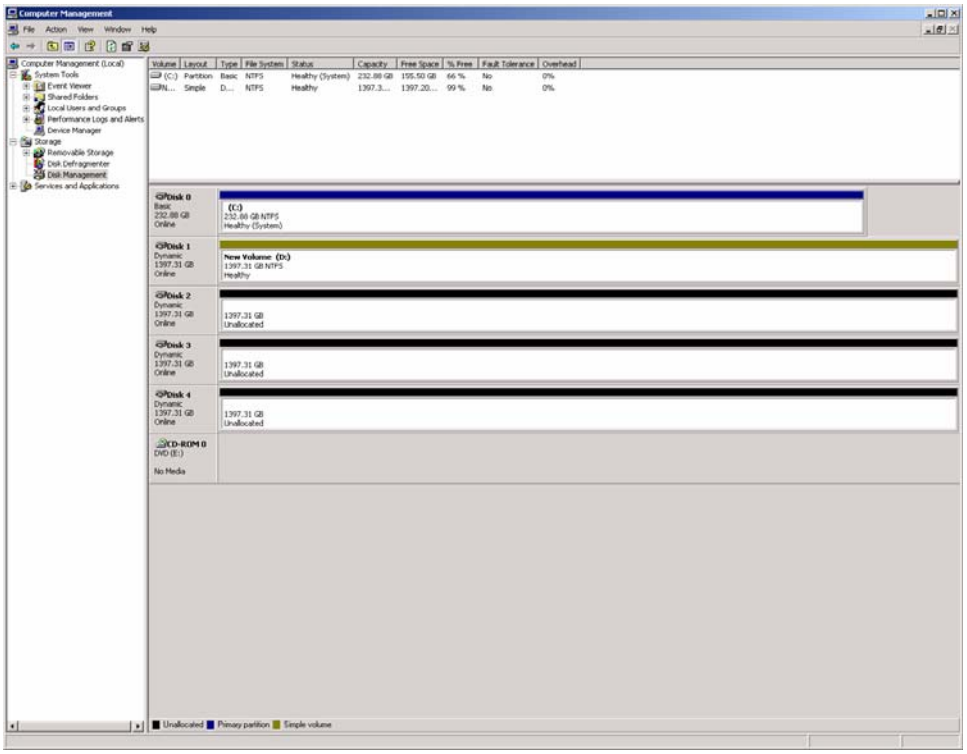

FIGURE 6-28. Computer Management Screen, Showing the New Volume for Disk 1.

7. Right-click in the area below the next vPOD and select “New Volume”. Repeat steps 1 through 7 of this section for each vPOD.
8. Close the *Computer Management* screen after reviewing the settings of “New Volume (D:)” for all of the applicable disks. The MV 4440 is ready for operations.

Procedure for Striped Volumes Only

NOTE: As applicable, see the section entitled "Procedure for Unstriped Volumes Only" on page 6-23, to set-up unstriped volumes for the Windows operating system.

1. When the *New Volume Wizard - Select Volume Type* screen appears, set the "Volume Type" to "Striped". Click **NEXT >**. See Figure 6-29.

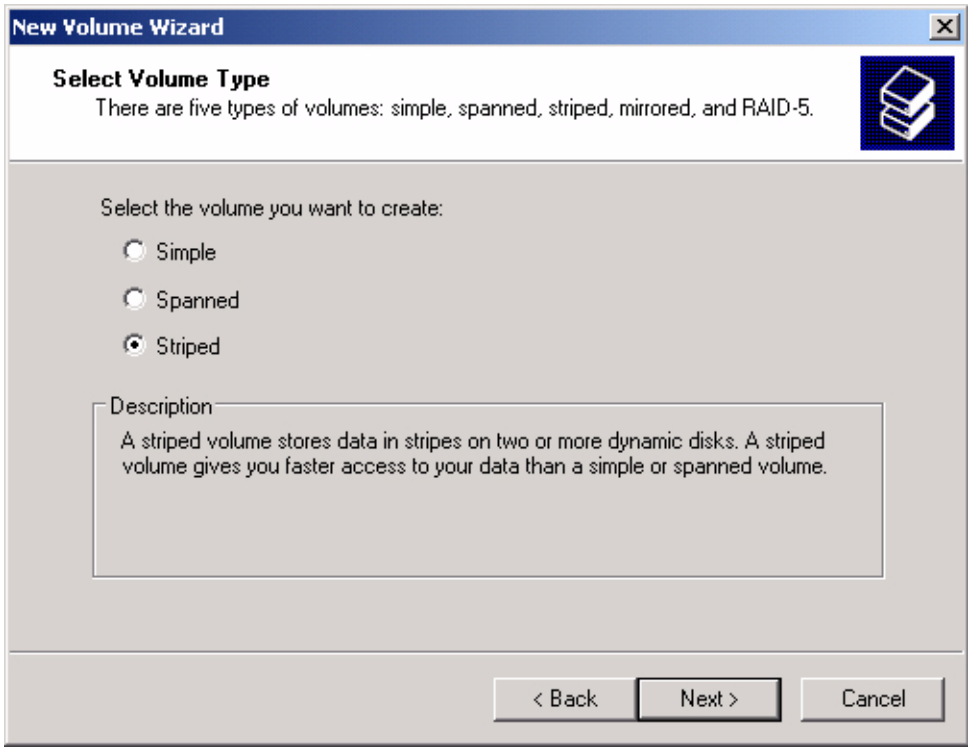
New Volume Wizard
Select Volume Type
There are five types of volumes: simple, spanned, striped, mirrored, and RAID-5.
Select the volume you want to create:
Simple
Spanned
Striped
Description
A striped volume stores data in stripes on two or more dynamic disks. A striped volume gives you faster access to your data than a simple or spanned volume.
< Back
Next >
Cancel

FIGURE 6-29. New Volume Wizard - Select Volume Type Screen, Showing "Striped" Selected.

2. The *New Volume Wizard - Select Disks* screen appears. Highlight “Disk 2”,“Disk 3”, and “Disk 4” in the “Available:” field. Click **ADD >** to move “Disk 2”,“Disk 3”, and “Disk 4” to the “Selected:” field. See Figure 6-30.

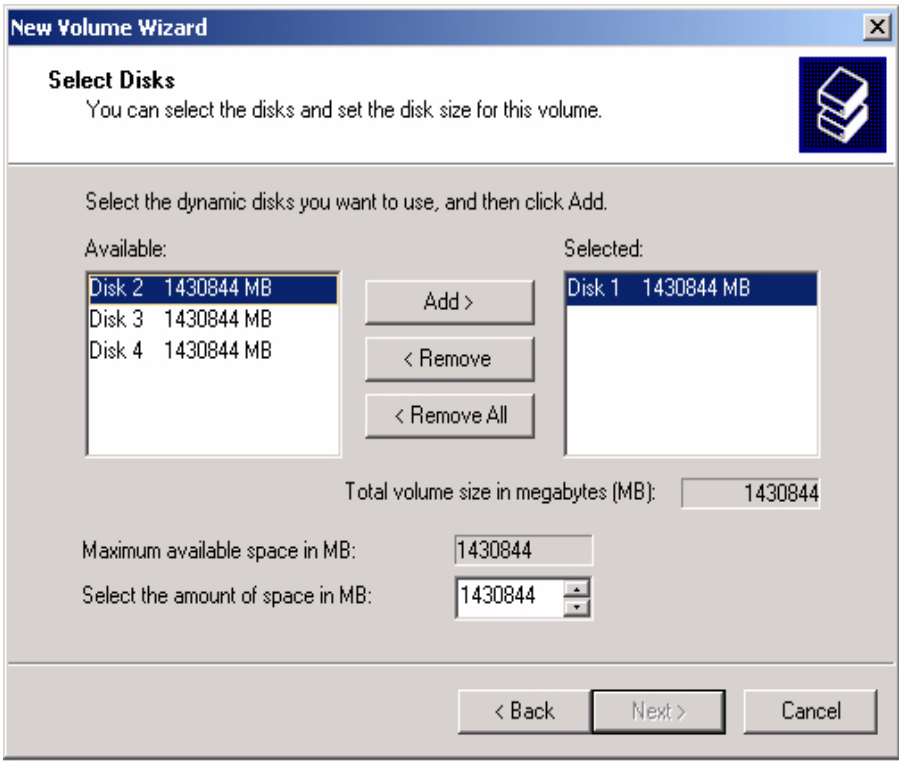

FIGURE 6-30. New Volume Wizard - Select Disks Screen.

3. At the bottom of the screen, at “Select the amount of space in MB:” select a number that is at 10MB less than the maximum available space of the disk. Click **NEXT >**. See Figure 6-31.

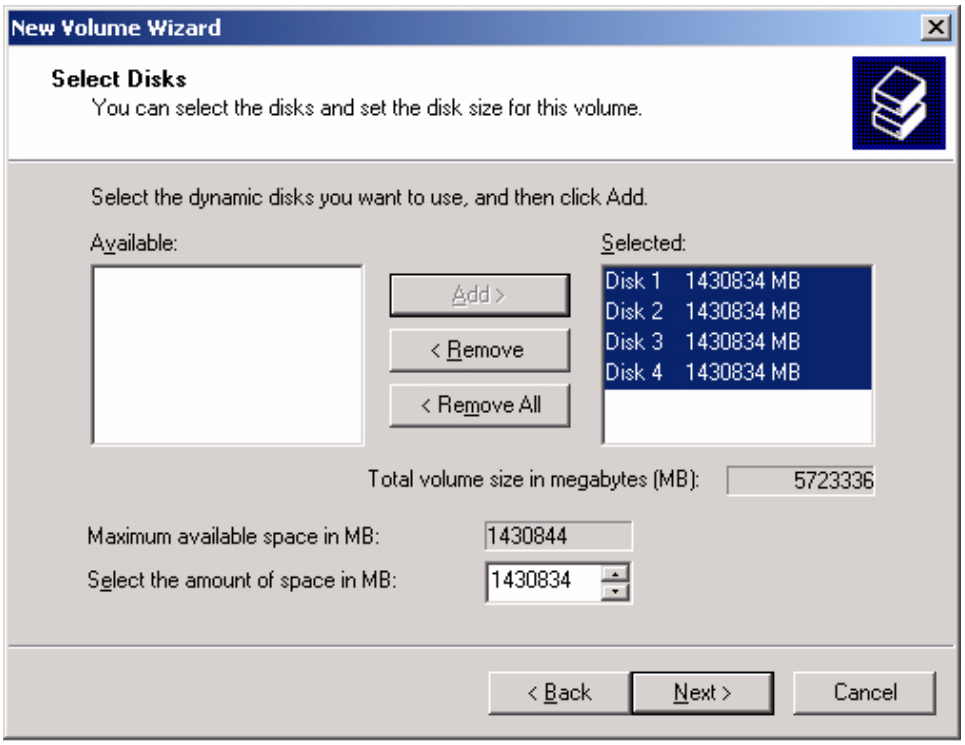
New Volume Wizard
Select Disks
You can select the disks and set the disk size for this volume.
Select the dynamic disks you want to use, and then click Add.
Available:
Selected:
Disk 1 1430834 MB
Disk 2 1430834 MB
Disk 3 1430834 MB
Disk 4 1430834 MB
Add >
< Remove
< Remove All
Total volume size in megabytes (MB): 5723336
Maximum available space in MB: 1430844
Select the amount of space in MB: 1430834
< Back
Next >
Cancel

FIGURE 6-31. New Volume Wizard - Select Disks Screen, With “Disk 1-4” Moved to “Selected:”.

4. The *New Volume Wizard - Assign Drive Letter or Path* screen appears. Change the drive (array) letter, as desired. Click **NEXT >**. See Figure 6-32.

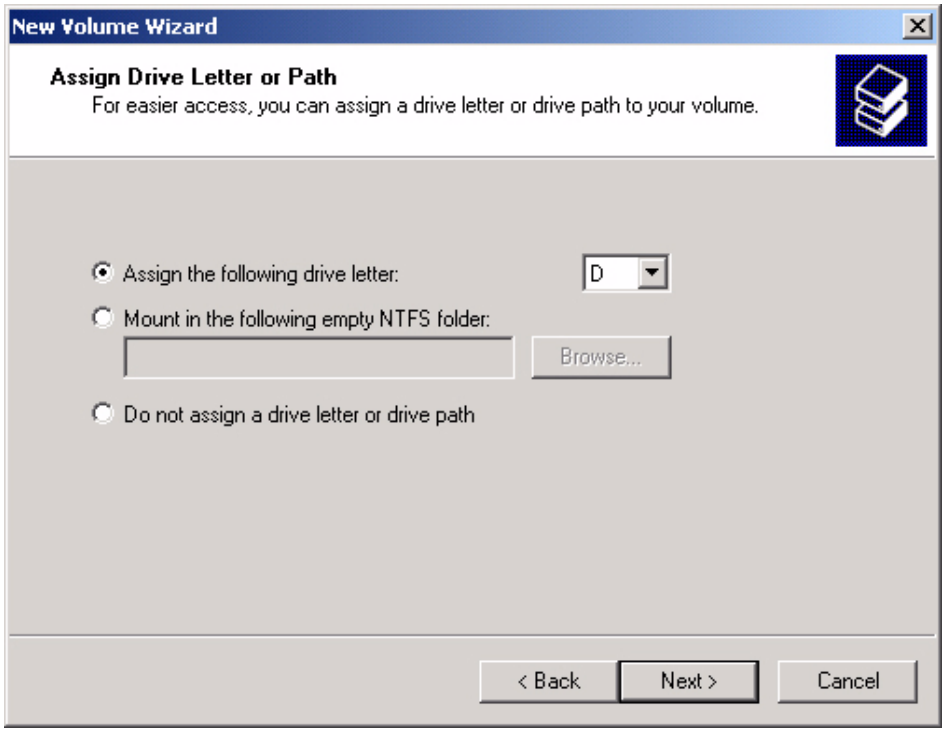
New Volume Wizard
Assign Drive Letter or Path
For easier access, you can assign a drive letter or drive path to your volume.
Assign the following drive letter:
D
Mount in the following empty NTFS folder:
Browse...
Do not assign a drive letter or drive path
< Back
Next >
Cancel

FIGURE 6-32. New Volume Wizard - Assign Drive Letters or Path Screen.

5. The *New Volume Wizard - Format Volume* screen appears. Select "Do not format this volume". Click **NEXT >**. See Figure 6-33.

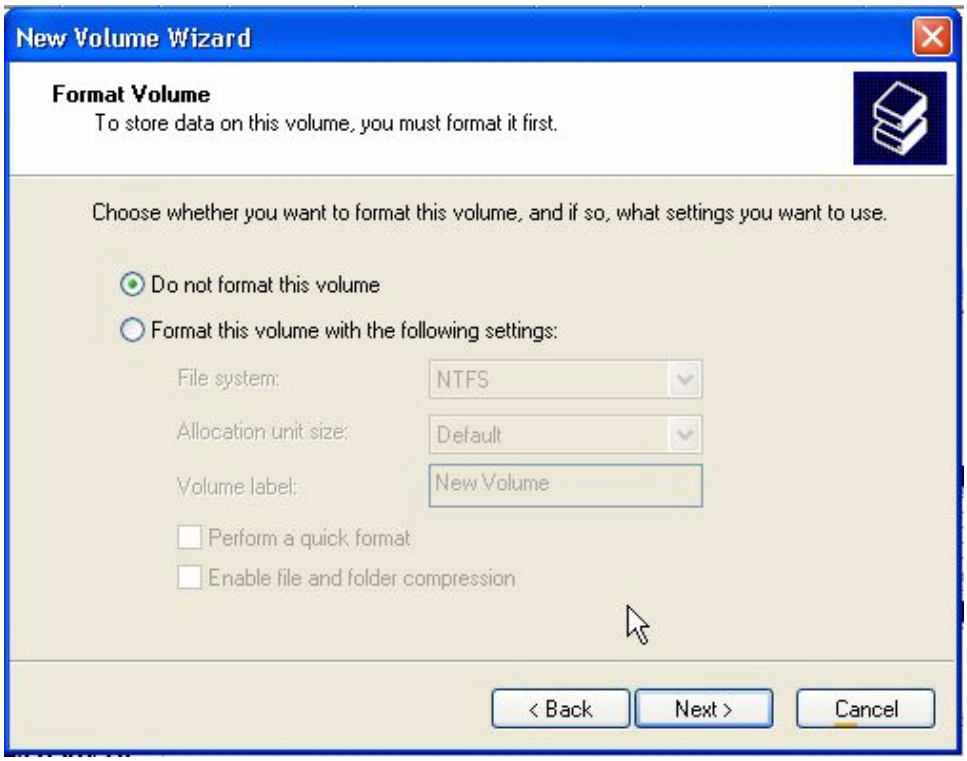
New Volume Wizard
Format Volume
To store data on this volume, you must format it first.
Choose whether you want to format this volume, and if so, what settings you want to use.
Do not format this volume
Format this volume with the following settings:
File system:
NTFS
Allocation unit size:
Default
Volume label:
New Volume
Perform a quick format
Enable file and folder compression
< Back
Next >
Cancel

FIGURE 6-33. New Volume Wizard - Format Volume Screen.

6. The *New Volume Wizard - Completing the New Volume Wizard* screen appears. Review the settings that have been made. If incorrect, click **< BACK** to make a correction at a previous screen. If OK, click **FINISH**. See Figure 6-34.

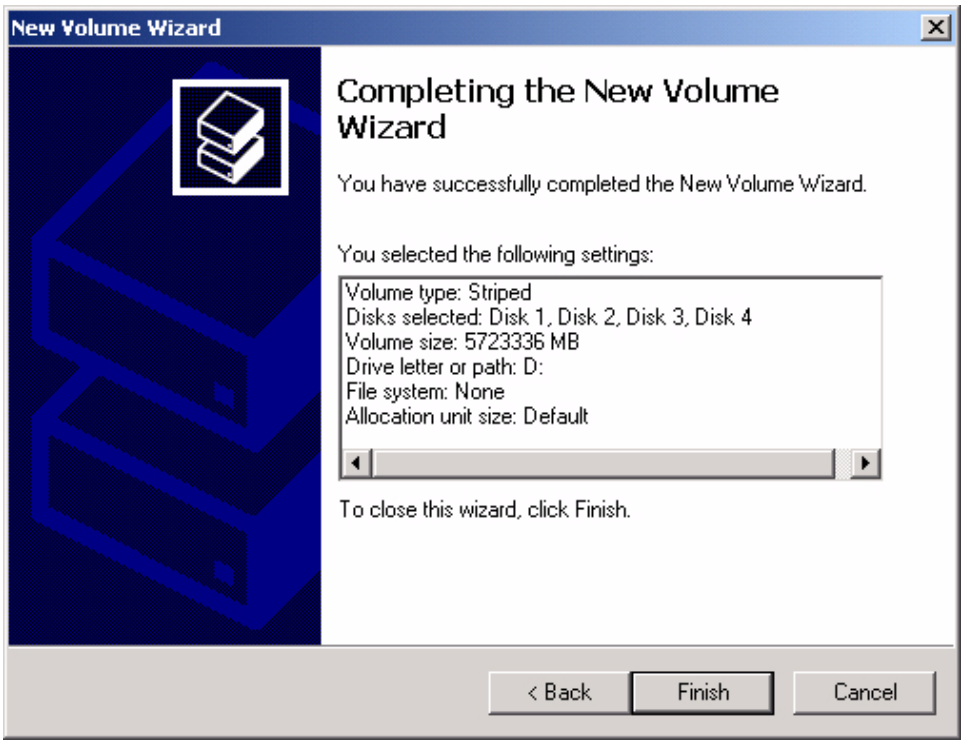
New Volume Wizard
Completing the New Volume Wizard
You have successfully completed the New Volume Wizard.
You selected the following settings:
Volume type: Striped
Disks selected: Disk 1, Disk 2, Disk 3, Disk 4
Volume size: 5723336 MB
Drive letter or path: D:
File system: None
Allocation unit size: Default
To close this wizard, click Finish.
< Back
Finish
Cancel

FIGURE 6-34. New Volume Wizard - Completing the New Volume Wizard Screen.

7. The *Computer Management* screen appears. It shows the settings of "New Volume (D:)" for Disk 1-Disk 4 (as applicable, per the number of vPODs). Close the screen. See Figure 6-35.

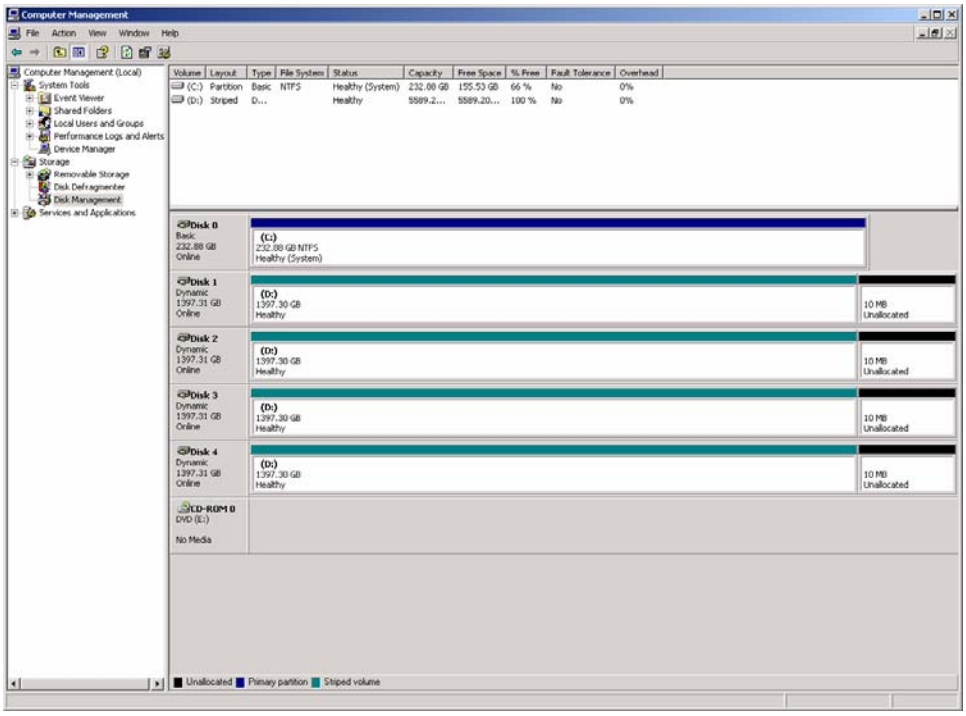

FIGURE 6-35. Computer Management Screen, Showing Formatted Disk 1 to Disk 4.

NOTE: Prior to performing step 8, obtain the WinLDM utility from the following Ciprico Inc. URL: ftp://ftp.ciprico.com/pub/MediaVault/winldm.zip. Uncompress the .zip file and save the .exe file to the C:\windows folder.

8. Access Start > All Programs [Programs] > Accessories > Command Prompt.
9. At the *Command Prompt* screen, type "winldm /lstripe". Press **ENTER**.
10. The *Command Prompt* screen lists all of the drives (devices) on the system. It inquires if you want to modify the striped partition. Type “Y” (make sure the “Y” is uppercase). Press **ENTER**. See Figure 6-36.

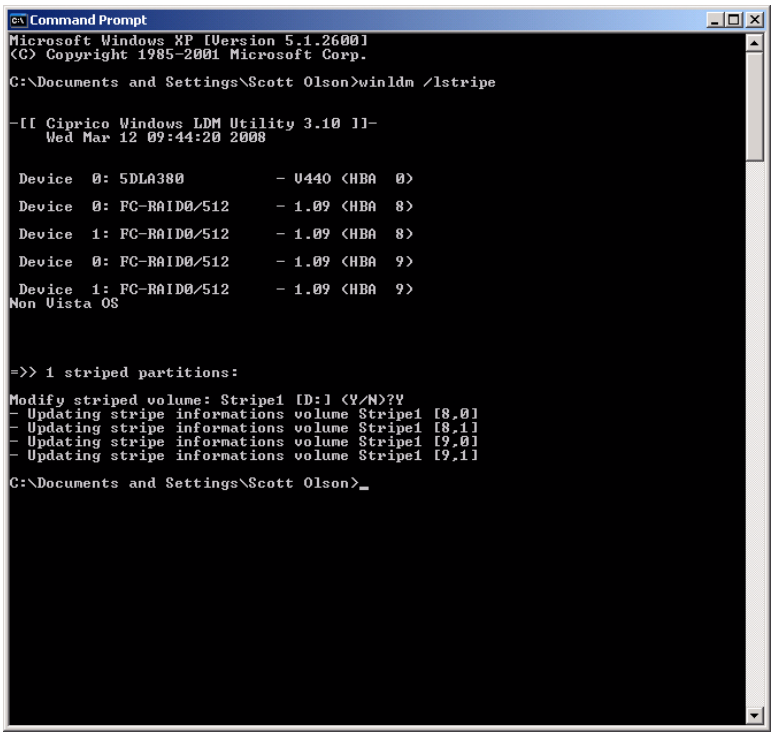
Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\Scott Olson>winldm /lstripe
-[[Ciprico Windows LDM Utility 3.10]]-
Wed Mar 12 09:44:20 2008
Device 0: 5DLA380 - V440 (HBA 0)
Device 0: FC-RAID0/512 - 1.09 (HBA 8)
Device 1: FC-RAID0/512 - 1.09 (HBA 8)
Device 0: FC-RAID0/512 - 1.09 (HBA 9)
Device 1: FC-RAID0/512 - 1.09 (HBA 9)
Non Vista OS
=>> 1 striped partitions:
Modify striped volume: Stripe1 [D:] (Y/N)?Y
- Updating stripe informations volume Stripe1 [8,0]
- Updating stripe informations volume Stripe1 [8,1]
- Updating stripe informations volume Stripe1 [9,0]
- Updating stripe informations volume Stripe1 [9,1]
C:\Documents and Settings\Scott Olson>

FIGURE 6-36. Command Prompt Screen, Showing the Listed Drives [Devices] and a “Y” Response to the “Modify striped volume...?” Inquiry.

11. Type “Exit”. Press **ENTER** to close the *Command Prompt* screen.

12. Reboot the computer.
13. After the computer boots-up, right-click on the “My Computer” icon on the desktop and select Manage. Or, left-click on Start >, then right-click on My Computer > Manage.
14. The *Computer Management* screen appears. Click “Disk Management” at the left side.
15. At the center of the screen, right-click on the “(D:)” drives at Disk 1 to Disk 4 (as applicable). From the pop-up menu select “Format...”. See Figure 6-37.

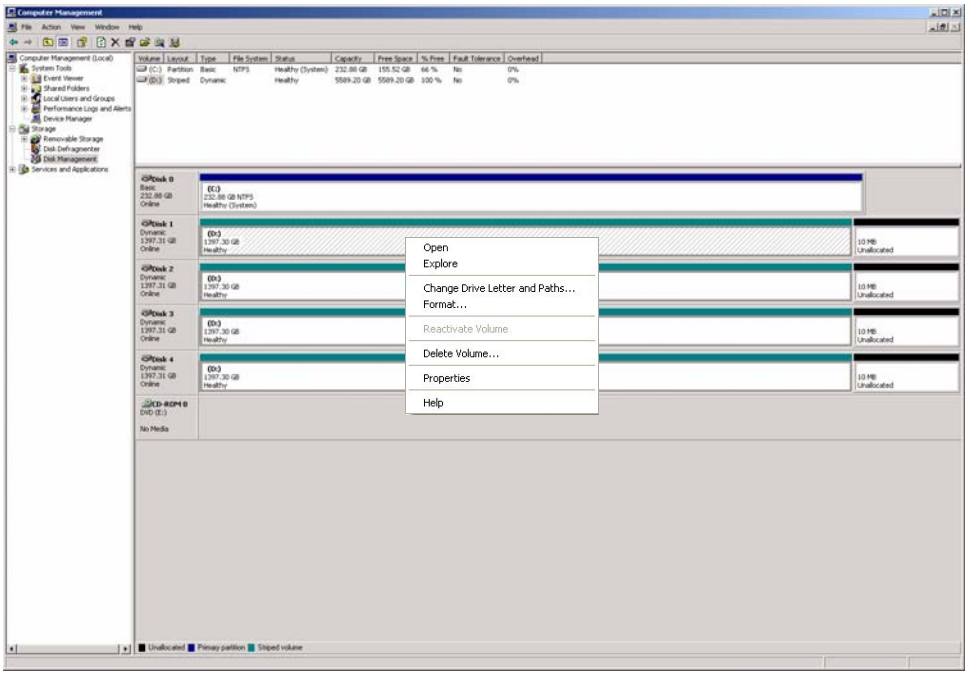

FIGURE 6-37. Computer Management Screen, Showing the Pop-Up Menu and “Format...”.

16. The *Format D:* screen appears. At “Volume label:” give the volume a name. Make sure that the “Perform a quick format” checkbox is checked. Click **OK**. See Figure 6-38.

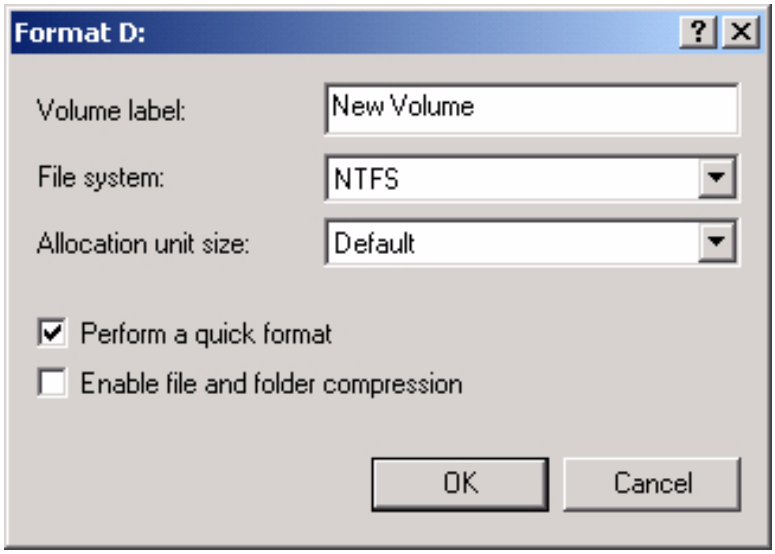

FIGURE 6-38. Format D: Screen.

17. The *Format D:* warning dialog box appears. Click **OK**. See Figure 6-39.

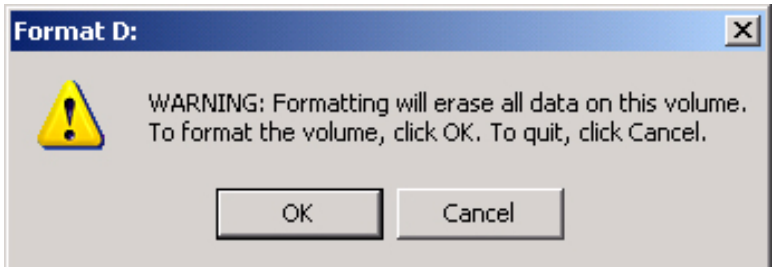
Format D:
WARNING: Formatting will erase all data on this volume.
To format the volume, click OK. To quit, click Cancel.
OK
Cancel

FIGURE 6-39. Format D: Warning Dialog Box.

18. The *Computer Management* screen appears. Click **DISK MANAGEMENT** at the left side. The volume name, file system, and allocation unit size appear. See Figure 6-40.

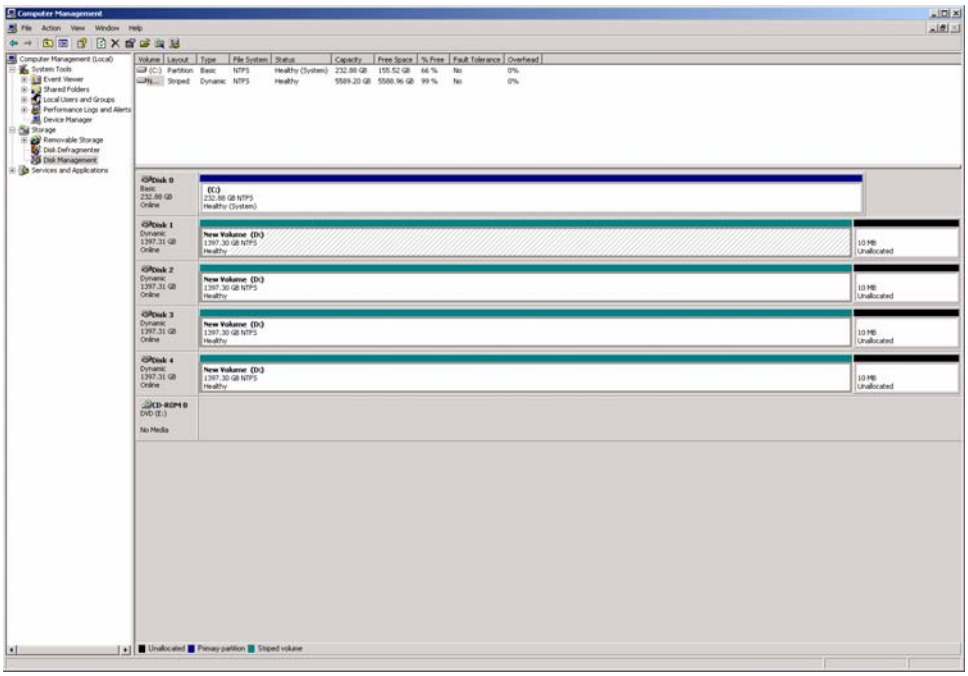

FIGURE 6-40. Computer Management Screen, Showing the Volume Name.

19. Close the *Computer Management* screen. The MV 4440 is ready for operations.

Chapter 7

Problem Solving

In this chapter...

Problem Solving Issues & Answers 7-2
Frequently Asked Questions (FAQs) 7-4

Problem Solving Issues & Answers

Review Table 7-1 for typical questions/problems, likely causes, and Ciprico Inc. recommendations.

For additional troubleshooting issues and answers, see the Ciprico Inc. Knowledge Base at <http://kb.ciprico.com/lore/index.php>.

TABLE 7-1. Problems, Likely Causes, and Recommended Solutions.

Issue/Problem	Likely Causes	Recommended Solutions
10 or less slow beeps (repeating over and over). Indicates that a drive with that number has a problem.	- A drive has failed - The drive backplane has failed - The IDE cable to the extender board has failed - The controller has failed.	Contact Ciprico Inc.
3 short/3 long beeps (Also known as 6 beeps) Indicates a communication time-out. This is broken into two categories: either a) The problem is outside of the array; or b) A drive is taking too long to respond.	Outdated/incorrect driver for host adapter installed; OS corrupt; faulty host adapter; faulty cable; faulty SFP. Can be caused by bad RAM on the controller, bad drive, bad drive backplane or bad extender board.	1. Determine whether the problem is on the host or the array. 2. Reinstall the host adapter drivers. 3. If this fails, contact Ciprico Inc. technical support for further instructions.
LED(s) stuck on immediately on power up Indicates that a controller is not getting power.	Can be caused by loose PCIe connection between the extender board and the controller, a bad connection between the extender board and the power connection on the frame, or a defective power supply.	Contact Ciprico Inc. technical support for further instructions.
Immediate continuous tone (high-pitched) on power-up Indicates that the controller either isn't getting proper power or that the controller failed.	Can be caused by any of the above problems.	Contact Ciprico Inc. technical support for further instructions.

TABLE 7-1. Problems, Likely Causes, and Recommended Solutions.

Issue/Problem	Likely Causes	Recommended Solutions
Other Hardware Failure	Includes: - LED failure - Beeper failure - Switch failure - A problem inside the chassis.	Contact Ciprico Inc. technical support for further instructions.
Lost Volume	Includes: - Drive or multiple drives down - Faulty controller - Incorrect driver installed when array was formatted/striped - Incorrect/corrupt driver installed now - Failed host adapter - Computer virus - SAN software not controlling the volume - Array powered off while writing - Incorrect/faulty cable - Failed SFP - Application failed to write properly - Host computer locked up - OS is corrupt - Boot drive security is corrupt.	1. Depends on the cause, as listed the problems above. 2. If all hardware, OS, drivers, and array are verified good, then data recovery software might be needed to get the data back. 3. Contact Ciprico Inc. technical support for further instructions.

Frequently Asked Questions (FAQs)

TABLE 7-2. Frequently Asked Questions.

What is the proper placement of my MediaVault?	The MV 4440 can be operated in a tower configuration only. Whenever possible, do not place the unit near the floor, as it will pick up more dust.
What are typical data-rate speeds?	The internal data rates per vPOD range anywhere from 500MB/sec to about 606MB/sec. Striping the four vPODs together provides a sustained data rate of 1000MB/s.
What is striping?	Striping is a technique where different parts, called sectors, of different disk drives are used alternately in sequence. This is done for several possible reasons: a) Gaining performance; b) Increasing reliability; or c) Increasing capacity.
What is spanning/concatenation?	This is a technique where hard disk drives are used end-to-end, i.e. where one fills up the data continues on to the next. This is strictly done for capacity, and has no gains in either speed or reliability.
What is mirroring?	Mirroring is where data, when written, is written to two different disks or sets of disks -- i.e. the same copy in both places. This offers reliability, at the cost of capacity and speed.
What is RAID 0?	In RAID 0, the disk drives are striped with corresponding sectors of other drives, called strips, sequentially. Data written goes to sector 1 of drive 1, then sector 1 of drive 2, and so on. RAID 0 sacrifices data protection to gain capacity and performance. To do RAID 0 requires a minimum of 2 disks. The MV 4440 has four sets of 10 2.5-inch disk drives.
What is RAID 5?	In RAID 5, the sectors of corresponding disk drives form what is called a sector strip. One sector of this strip is used for parity (this sector is alternated to different drives in each strip). Parity is information used to read or recreate missing data in the event that a drive fails.

TABLE 7-2. Frequently Asked Questions.

What is RAID 6?	As in RAID 5, RAID 6 staggers its parity information across multiple drives. Its major difference, however, is that it writes two parity blocks for every stripe of data, which means that the array is capable of remaining accessible to the users even after having sustained two simultaneous drive failures. The advantage of a RAID 6 array versus a RAID 5 array with a hot spare risk is that no rebuilding is necessary to bring the last disk into the array in the event of a failure. In this sense, performance is more or less guaranteed after a single disk failure under RAID 6, whereas a significant performance hit occurs during the rebuilding required under RAID 5. RAID 6's parity scheme is not simply multiple copies of the same parity information, but rather two different means of calculating parity information for the same data. This results in a much higher computing overhead than the already-intensive RAID 5 scheme, and a resulting increase in controller/CPU usage. This requirement for the second parity calculation and write, however, further adversely impacts the write performance of a RAID 6 array versus a RAID 5 solution. RAID 6 is an excellent choice for both extremely mission-critical applications and in instances where large numbers of disks are intended to be used in the array to improve read performance.
What is the self-healing feature I've heard about?	This is a new name given to a slightly new technique for relocating bad sectors on the disks. Rather than relocate the actual sector, a pointer for the sector number is used. When a bad sector is found, the pointer updates to skip that area - this is done while the drive is reading/writing. If you were to watch the performance of this bad sector, as the performance appears to increase, it could be said the sector was "cured."
Do I need to do any software-based preventative maintenance on the array	No. Programs, such as Disk First Aid, Scan Disk, etc. are not recommended
How do I defragment the array?	Defragmenting software is not recommended. The best way to defragment the array is to back it up, reformat/restripe it, then restore the backup.

TABLE 7-2. Frequently Asked Questions.

What is journaling and should I use it?	Journaling is where the computer (in the background), logs all disk transactions, such as file open, file write, file read, file close. In the event of volume corruption, this journal is easy for recovery programs to find on the disk and make repairs, based on this file. We recommend journaling (if your OS supports it), in case of such corruption.
I've heard journaling makes the array run slower - should I still use it?	Journaling only slows down the array by about 2KB/sec. For the most part, when a journal entry is written, it is usually only a few bytes of data, and doesn't update non-stop. The benefits greatly outweigh the small decrease in data rate
Do I need to do anything to keep my MV 4440 clean?	Clean the unit with a soft cloth. If further cleaning is necessary, use a mild liquid soap.

Chapter 8

Maintenance

In this chapter...

vPOD Hot-Swapping 8-2
vPOD Hot-Swap Procedure 8-3

vPOD Hot-Swapping

If a vPOD fails or malfunctions, or if you wish to swap-out a functioning vPOD while the MV 4440 is powered-up, perform the “vPOD Hot-Swap Procedure” on page 8-3.

Return a failed or malfunctioning vPOD to Ciprico Inc. See Appendix D, *Limited Warranty and Return Parts Policy*, for information regarding returned parts.

vPOD Hot-Swap Procedure

NOTE: Although a vPOD attempts to notify the host computer that it is no longer present in the MV 4440, it is the responsibility of the host computer software to be aware of this status change. Do not remove a vPOD while critical data is being written from the host computer to the MV 4440.

1. On the back of the vPOD to be removed, change the **MODE SELECT** switch setting to “14”. (This option must be used to safely remove the device and preserve data). See Figure 8-1.
2. Press and hold-in the **MODE SET** button. Listen for a sequence of beeps. After the third sequence (that is, three equal-length tones) remove the vPOD from the MV 4440 chassis by removing all connected cables and unscrewing the two thumbscrews. See Figure 8-1.

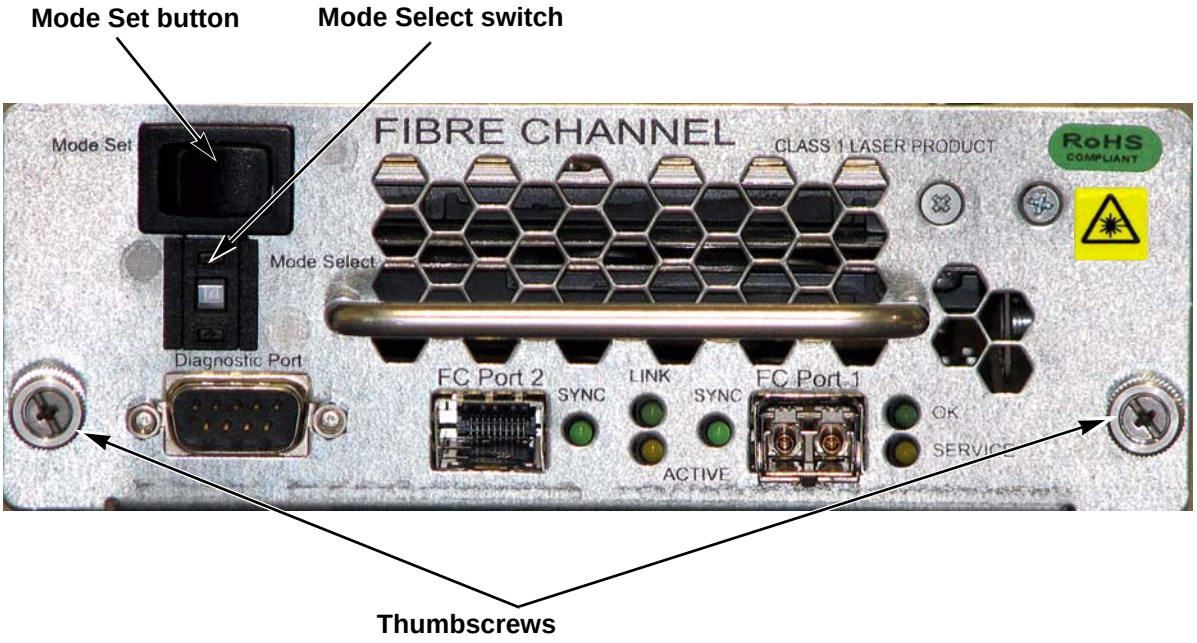

FIGURE 8-1. Mode Set Button, Mode Select Switch, and Thumbscrews of a vPOD.

NOTE: The Activity LED on the back of the vPOD goes off, which indicates that it is safe to remove the vPOD.

3. Install a replacement vPOD in the MV 4440. Insert the required cables. Tighten the thumbscrews.
4. Set the **MODE SELECT** switch of the replacement vPOD to the previously used setting, in order to perform operations such as reconstruction. However, if the vPOD will be hot-swapped frequently and there is no need to change the RAID mode, the **MODE SELECT** switch can be set to "14".

APPENDIX A

Product Information

In this chapter…

Specifications A-2
Model Numbering A-3
Video Resolution Data A-4
RAID Compatibility A-5

Specifications

TABLE A-1. Specifications for the MV 4440.

Specification	Value or Range
Current draw * (117 Vac, for a 4 vPOD unit)	Start-up/Peak: 1.92 A / 224.64 W Seek/Run-Time: 1.48 A / 173.16 W Idle: 1.2 A / 140.4 W
Current draw * (220 Vac, for a 4 vPOD unit)	Start-up/Peak: 1.02 A / 224.4 W Seek/Run-Time: 0.85 A / 187 W Idle: 0.68 A / 149.6 W
Data transfer (per vPOD)	Burst: 320-380 MB/s Maximum: ~ 380 MB/sec Minimum: 200 MB/sec
Drives	10 per vPOD
Interface, host	4 Gbit Fibre Channel
Physical dimensions	6 5/8-in. wide x 14 1/2-in. high (including handle) x 18 1/4-in. deep.
Power	Auto switching, 100-240 Vac, 50-60 Hz
RAID Levels	RAID 0, 6
Relative humidity	Operating: 5%-80% non-condensing Non-operating: 5%-95% non-condensing
Temperature range	Operating: 41 to 104 degrees F. (5 to 0 degrees C.) Non-operating: - 40 to 158 degrees F. (-40 to 70 degrees C.)
Weight	49.6 lbs. (22.5 kg.)

* All current draw values are peak values.

Model Numbering

The MediaVault model number for the MV 4440 is:

83005266 = Chassis with power supply unit

83005267 = vPOD with 250 GB drives

Video Resolution Data

TABLE A-2. Video Resolution Data Rates

Video Resolution	Data Rate, Megabytes/Sec
DV/DV25	3.7
DV 50	7.4
SD, 8 bit	20
SD, 10 bit, 4:2:2	27
HD 1080i, 8 bit	120
HD 1080i, 10 bit, 4:2:2	155
HD 720p, 8 bit	110
HD 720p, 10 bit, 4:2:2	138

TABLE A-3. Video Resolution vs. Hours per Terabyte

Video Resolution	Hours per Terabyte (1000 gigabytes)
DV/DV25	75.1
DV 50	37.5
SD, 8 bit	13.9
SD, 10 bit, 4:2:2	10.3
HD 1080i, 8 bit	2.3
HD 1080i, 10 bit, 4:2:2	1.8
HD 720p, 8 bit	2.5
HD 720p, 10 bit, 4:2:2	2.7

RAID Compatibility

For Macintosh Operating Systems

TABLE A-4. Compatibility by Mode and Partition.

Media Vault Mode Selection	Apple Non-Striped Partition (standard) G4/G5 PowerMac	Apple Striped Partition (RAID 0) G4/G5 PowerMac	Mac Pro (Intel-based) Apple Non-Striped Partition (standard)	Mac Pro (Intel-based) Apple Striped Partition (RAID 0)
RAID 0 (mode 0)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 6/4K (mode 1)				
OS X Apple Disk Utility	OK	not-compatible	OK	not-compatible
RAID 6 (mode 2)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 0 (mode 3)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 6/4K (mode 4)				
OS X Apple Disk Utility	OK	not-compatible	OK	not-compatible
RAID 6 (mode 5)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 6 (mode 8)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 0/4K (mode 9)				
OS X Apple Disk Utility	OK	not-compatible	OK	not-compatible

For Windows 2000/2003/XP Operating Systems

TABLE A-5. Compatibility by Mode and Partition.

Media Vault Mode Select	Non-Striped Partition (standard)	Striped Partition (RAID 0)
RAID 0 (mode 0)		
Windows 2000 /2003/ XP	OK	OK
RAID 6/4K (mode 1)		
Windows 2000 /2003/ XP	Basic Disk only, no Dynamic	Not compatible
RAID 6 (mode 2)		
Windows 2000 /2003/ XP	OK	OK
RAID 0 (mode 3)		
Windows 2000 /2003/ XP	OK	OK
RAID 6/4K (mode 4)		
Windows 2000 /2003/ XP	Basic Disk only, no Dynamic	Not compatible
RAID 6 (mode 5)		
Windows 2000 /2003/ XP	OK	OK
RAID 6 (mode 8)		
Windows 2000 /2003/ XP	OK	OK
RAID 0/4K (mode 9)		
Windows 2000 /2003/ XP	Basic Disk only, no Dynamic	Not compatible

APPENDIX B

Compliance Statements

In this chapter…

FCC Compliance Statement B-2
Industry Canada Compliance Statement B-3
CE Compliance Information B-3
European Union Compliance Statement B-4

FCC Compliance Statement

The MediaVault family of products complies with FCC Rules Part 15. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Industry Canada Compliance Statement

ICES-003. This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe `B' est conforme á la norme NMB-003 de Canada.

For further compliance information, contact Ciprico Inc., using the information given on page iv of this manual.

CE Compliance Information

The MediaVault product family conforms to:

EN55022:1998/CISPR 22:1997, Class B - Limits and Methods of measurement of Radio Disturbance Characteristics of Information Technology Equipment.

L'INFORMATION DE CONFORMITE DE LA CE

La famille de produit de RAIDCore se conforme a:

EN 55022:1998/CISPR 22:1997, Classe B - Limites et methodes de mesure des caracteristiques d'interferences radiophoniques, Materiel des technologies de l'information.

CE-BEFOLGUNGINFORMATIONEN

EN 55022:1998/CISPR 22:1997, - Klasse B - Grenzwerte und Messverfahren für Funkstörungen von Einrichtungen der Informationstechnik.

European Union Compliance Statement

This Information Technologies Equipment has been tested and found to comply with the following European directives:

- European Standard EN55022 (1998) Class B
- European Standard EN50081-1 (1992)

APPENDIX C

Updates

In this chapter…

Firmware Updates C-2

Firmware Updates

From time to time firmware updates are made available to maintain compatibility with latest software releases, correct problems, or add new features.

If you are experiencing problems with the MediaVault you might want to go on-line and visit the Ciprico Inc. Web site, at http://kb.ciprico.com/lore/index.php to check for any available firmware download for the MediaVault series products.

APPENDIX D

Limited Warranty and Return Parts Policy

In this chapter…

Limited Warranty D-2
Disclaimers of Warranty and Limitations of Remedy D-3
Inspection and Acceptance D-3
Advanced Replacement Option D-4
Inspection and Acceptance D-4
Return Parts Policy D-5
What Items to Return D-6
How to Return the Product D-7
Repaired Parts and Return Shipment D-7

Limited Warranty

Ciprico Inc. warrants that from a period of three (3) years from the date of shipment to customer, each product will be free from defects in materials and workmanship. The liability of Ciprico Inc. under this warranty is limited to replacing, repairing, or issuing credit (at the discretion of Ciprico Inc.) for any devices which are returned by the purchaser during such period, proved that (a) Ciprico Inc. is promptly notified in writing upon discovery of such defects by purchaser, and (b) the defective product is returned to Ciprico Inc. transportation charges prepaid by purchaser, and (c) examination of such unit by Ciprico Inc. discloses to its satisfaction that such defects have not been caused by normal wear, misuse, neglect, improper installation, repair, alteration or accident. Equipment, accessories, disk drives, and similar items not manufactured by Ciprico Inc. are subject only to adjustments as can be obtained from the original supplier by Ciprico Inc. In no event shall Ciprico Inc. be liable to purchaser for indirect or consequential damages of any kind.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, EXCEPT AS TO TITLE.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitation or exclusions may not apply to you.

Disclaimers of Warranty and Limitations of Remedy

EXCEPT AS PROVIDED IN THIS WARRANTY POLICY, CIPRICO INC. (ON ITS OWN BEHALF AND ON BEHALF OF ANY IF ITS AGENTS) DISCLAIMS ALL WARRANTIES, WHETHER EXPRESSED OR IMPLIED, AND SPECIFICALLY DISCLAIMS THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CIPRICO INC. WILL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OR FOR ANY OTHER LOSSES, EXPENSES OR DAMAGES RELATING TO PRODUCT DEFECTS OR FAILURES. YOUR SOLE REMEDY, AND CIPRICO INC.'S SOLE OBLIGATION, WITH RESPECT TO ANY PRODUCT DEFECTS OR FAILURES (REGARDLESS OF WHETHER YOUR CLAIM IS ASSERTED IN CONTRACT, TORT, STRICT LIABILITY OR OTHERWISE) SHALL BE (AT CIPRICO INC.'S OPTION) REPAIR, REPLACEMENT OR REFUND OF THE PRICE PAID.

Inspection and Acceptance

Customer shall inspect all shipments within forty-eight (48) hours after arrival and notify Ciprico Inc. in writing within two (2) days of any shortages or other failures to conform to the Agreement which are reasonably recoverable upon arrival, including, without limitation, any claim that product fail to conform to the applicable specification. Customer shall allow Ciprico Inc. a reasonable opportunity to inspect the product to enable Ciprico Inc. to verify the alleged nonconformity. Customer's failure to timely notify Ciprico Inc. in writing of any alleged nonconformity of product or sale or any processing of the product shall constitute an immediate and irrevocable acceptance of product and an acknowledgment by customer that product delivered was accepted.

Advanced Replacement Option

For a period of thirty (30) days, forty-five (45) days for International, from the date of shipment to the customer, Ciprico Inc. will provide the customer with an advanced replacement of the defective product or component. Under this option, the customer shall return the defective product or component to Ciprico Inc. upon receipt of the replacement item. The customer will be invoiced for any advanced replacement items not returned to Ciprico Inc. within thirty (30) days of the advanced replacement shipment. To obtain an advanced replacement and a Return Materials Authorization (RMA) number, contact Ciprico Inc. Inside Sales at 1-800-727-4669.

Customer Responsibilities for MV 4440 Usage and Damage

The customer is responsible for using the MV 4440 as it was designed, manufactured, and intended to be used. The customer is responsible for:

- Determining whether the MV 4440 is appropriate for the customer's applications and systems.
- Determining whether the MV 4440 will integrate with the customer's equipment and systems with malfunction or damage.

The customer is also responsible for backing up data before installing the MV 4440 on their equipment and systems, and for regularly backing-up data after the MV 4440 is installed and in operation.

Return Parts Policy

Any warranty or service returns must be accompanied by an approved Return Materials Authorization (RMA) number to ensure prompt handling and processing.

Spare parts manufactured by Ciprico Inc. and purchased from Ciprico Inc. after the original disk array order carry a three (3) year warranty. Host Bus Adapters and spare parts (including drives) not manufactured by Ciprico Inc. will carry whatever warranty is supported by manufacturer, and customer will be advised to seek remedy through the appropriate manufacturer. Ciprico Inc. will make effort to assist customer, however any assistance outside of nominal facilitation will be billed at current hourly rate.

If the MV 4440 is suspected of malfunctioning or not performing as expected, conduct Ciprico Inc. Technical Support at 1-877-484-3797, extension 7, or through the Ciprico Inc. Web site at http://www.ciprico.com.

Provide the service support personnel with the following information:

- MV 4440 model and serial number
- Return shipping address
- Daytime telephone number
- Description of the problem
- Copy of the original purchase invoice

The service support personnel will assist you in determining whether the MV 4440 requires repair. If the products needs repair, the Service Support department will issue an RMA (Return Materials Authorization) number.

IMPORTANT: Obtain an RMA number from Service Support before you return the MV 4440. Include the RMA number on the shipping label. The RMA number is crucial for tracking the returned MV 4440 and providing proper service.

What Items to Return

Return the following items to Service Support at Ciprico Inc.:

- The MV 4440 covered by the Ciprico Inc. warranty. Do not return cables, manuals, etc.
- A copy of the original invoice as a proof-of-purchase.

Mail the damaged MV 4440 and a copy of the invoice to:

Destination	Address
USA and Canada	Ciprico Inc. 7003 W. Lake Street, Suite 400, St. Louis Park, MN 55426, USA
Other countries	Return the MV 4440 to your dealer or retailer. Contact them for instructions, before shipping the product.

How to Return the Product

Follow these guidelines for returning the MV 4440 to Ciprico Inc.

- Use the original shipping carton and packaging.
- Package the MV 4440 as carefully as possible. (The product might be damaged, but still reparable).
- Use a form or sheet of paper to describe the product's problem(s).
- On the shipping label, include an "Attention:" line, with the approved RMA number.
- Include a copy of the original invoice in the carton.

The customer is responsible for the cost of insuring and shipping the MV 4440 to Ciprico Inc. Damage that is incurred due to improper packaging and/or transportation is not covered under the Ciprico Inc. Limited Warranty.

Repaired Parts and Return Shipment

When repairing the returned MV 4440 Ciprico Inc. might replace defective or damaged parts with new or reconditioned parts. Ciprico Inc. might replace the entire product with a new or reconditioned product.

In the event of a replacement, the replacement unit will be under warranty for the remainder of the original warranty term from date of purchase, or 30 days, whichever is longer.

The customer is responsible for prepayment of shipping costs, when returning the defective or damaged product.

APPENDIX E

Fabric Switch Zoning

In this chapter…

Fabric Switch Zoning E-2
- Background Information E-2
- Fabric Switch Zoning Techniques E-2
- SAN Software Examples E-4

Fabric Switch Zoning

IMPORTANT: The techniques and examples described in this appendix are for information only. Many different zone and port configurations are possible, and not all configurations have been validated and/or verified for use with the MV 4440 unit.

Background Information

If an array or multiple arrays and multiple computers are attached to a fibre channel switch, by default the switch acts as a hub, relaying information from all ports to all other ports.

A number of problems are created, however. If a computer has two ports, both ports being connected to the switch, and a single channel array is connected to the switch, the computer sees the array twice. In most cases, if this occurs, the computer is confused and does not format the array properly. With a dual-channel array, the computer sees it four times. To prevent this, something must be done with the switch.

Fabric Switch Zoning Techniques

As Fibre channel switches advanced, they became managed. They used switch management software to control the settings on-the-fly. Also, different ports could be grouped into layers. The ability of a switch to have this capability is called a "Fabric Switch." The process of doing the settings is called "Zoning," because several zones are created that do not affect each other. Zoning also fixes another problem: unused ports.

There are three techniques for zoning:

- Plain and Simple (has a tendency to be “trafficky”)
- Host Grouped
- 1:1 Relational

Example 1

Here is a basic example, with a dual-channel computer and MV 4440 with four vPODs: Channels 1 and 2 of the computer are attached to ports 1 and 2 of the switch. The four channels of the array are attached to ports 3 and 4, 5, and 6 of the switch. The switch is ten-port.

By default, without zoning, the computer sees two copies of each vPOD on each of the two channels. Each channel of the array sees two copies of the computer. The switch also constantly tests the remaining four ports to see if anything is attached. To fix this problem, the switch needs to be zoned, per the following 1:1 Relational set-up:

Create two zones:

- Zone 1 contains ports 1, 3, and 5
- Zone 2 contains ports 2, 4, and 6

This setup limits channel 1 of the computer to communicating only with two channels of the vPOD, while limiting channel 2 of the computer to communicating only with the other two vPODs. All other ports on the switch are locked out.

Example 2

With another dual-channel computer, it would be possible to set up two more zones similar to the above, on the same switch. But zoning is most appropriate when the switch has multiple arrays or multiple host. In Example 2, a dual-channel computer is attached to ports 1 and 2 of the switch, with the second dual-channel computer attached to ports 3 and 4. The four vPODS are attached to ports 5 through 8 on the switch. Review the following, using the Plain and Simple technique, then the 1:1 Relational technique:

<u>Plain and Simple</u>

Create two zones:

- Zone 1 contains ports 1, 3, 5, and 7
- Zone 2 contains ports 2, 4, 6, and 8

<u>Host-Grouped</u>

Create four zones:

- Zone 1 contains ports 1, 5, and 7
- Zone 2 contains ports 2, 6, and 8
- Zone 3 contains ports 3, 5, and 7
- Zone 4 contains ports 4, 6, and 8

1:1 Relational
Create eight zones:

- Zone 1 contains ports 1 and 5
- Zone 2 contains ports 2 and 6
- Zone 3 contains ports 1 and 7
- Zone 4 contains ports 2 and 8
- Zone 5 contains ports 3 and 5
- Zone 6 contains ports 4 and 6
- Zone 7 contains ports 3 and 7
- Zone 8 contains ports 4 and 8

In the Plain and Simple configuration, the setting works, though occasionally one channel of the array might test the corresponding channel of the other array and/or the other computer, causing a very slight amount of extra traffic on the line. The Host-Grouped method eliminates this crosstalk between the arrays, but does not correct for the crosstalk between the computers. In the 1:1 Relational configuration, this problem is alleviated, but the drawback is that it is harder to set up on the switch. Whenever possible, set up 1:1 Relational zones if the Storage Area Network (SAN) software supports it.

SAN Software Examples

Example 1

Here is a simple SAN software example, using two dual-channel computers and four vPODs in an MV 4440. The computers are attached to ports 1, 2 and 3,4 respectively of the switch, and the array attached to ports 5 through 8. Although this setup can function unzoned, zoning is required to keep the computers from "chatting" with each other, rather than the array. Two zones are required. See Example 2 above for the zoning.

At first, everything seems OK, until one computer formats the array. The other computer thinks the array is unformatted and tries to erase the array whenever possible. If one computer writes files to the array, the directory will be in that computers' cache and the other computer might not see it. If the other computer writes to the array, the first computer might destroy those files, thinking that part of the array is blank.

To avoid this, SAN software is required. In it's simplest form, SAN software sends information to both computers that it is updating the array. This information is usually passed through Ethernet, rather than Fibre Channel.

SAN software can perform more complex functions, such as giving users different access to different parts of the arrays, or limiting bandwidth. SAN software typically requires a client program/license be installed on each client. However, if the number of clients becomes too great, it is recommended that a dedicated server also be used to manage the flow of the data.

Example 2

Here is a more complex example, using two hosts, one with a dual-channel host adapter (attached to ports 1 and 2), the second host computer with a quad-channel host adapter attached to ports 3 through 6. The Host-Grouped and 1:1 Relational techniques are used.

Host-Grouped

Create four zones

- Zone 1 contains ports 1, 3, and 7
- Zone 2 contains ports 2, 4, and 8
- Zone 3 contains ports 1, 5, and 9
- Zone 4 contains ports 2, 6, and 10

1:1 Relational

Create eight zones:

- Zone 1 contains ports 1 and 7
- Zone 2 contains ports 2 and 8
- Zone 3 contains ports 3 and 7
- Zone 4 contains ports 4 and 8
- Zone 5 contains ports 1 and 9
- Zone 6 contains ports 2 and 10
- Zone 7 contains ports 3 and 9
- Zone 8 contains ports 4 and 10

Glossary

TABLE G-1. Acronyms or Terminology.

Acronym or Word	Acronym Description	Definition
ATA	Advanced Technology Attachment	A standard interface for connecting a computer's storage devices, such as CD-ROMs and hard-drives.
BIOS	Basic Input/Output System	Built-in software routines, stored in ROM, that contain the code for controlling the keyboard, monitor, disk drives, serial communications, etc.
channel		A link that transports data point-to-point.
concatenation		The process of connecting entities end-to-end on a single communications channel.
CPU	Central Processing Unit	The computational segment of a computer.
DMA	Direct Memory Access	A method of transferring data from a storage device to RAM without using CPU resources.
HBA	Host Bus Adaptor	An adaptor card that includes the I/O logic, software and processing to manage the transfer ofthat information between the host system and devices connected to it.
HDT	HD Turbo	A mode that uses the highest data rate portions of the disk drives for maximum throughput until the disk is full, but with a tradeoff in total data capacity of the disk from 40% to 80%,depending on the RAID level.
IDE	Integrated Drive Electronics	Most commonly used data bus for PC's.
LED	Light Emitting Diode	An electronic device that illuminates when powered.
Linux		Free, open-source UNIX-based operating system.

TABLE G-1. Acronyms or Terminology.

Acronym or Word	Acronym Description	Definition
logical drive		One or more disk drives grouped together and which appear as a single device to an operating system.
mirroring		The duplication of data for backup, or a method of distributing network data traffic among several computers with identical (redundant) data.
NTFS	New Technology File System	The file system used by the Microsoft Windows NT/2000/XP operating systems.
parity		A type of data protection that recreates the data of failed disk drive.
port		A connection point to the RAID controller, disk drive, enclosure, or another device.
RAID	Redundant Array of Independent Drives	A method for storing the same data in different places on multiple hard disks (except for RAID 0, which does not have redundancy).
RTR	Real Time RAID	Allows RAID data to be identified, and for disk failures to be corrected, on the fly and without interrupting real-time data flow.
SMART	Self-Monitoring Analysis and Reporting Technology	A set of advanced diagnostics that monitor the internal operations of disk drives and provide early warning of any potential problems
striping		The process of partitioning each drive's storage space into units ranging from a sector (512K) up to several megabytes. Striping interleaves bytes or groups of bytes across multiple drives, so more than one disk is reading and writing simultaneously.

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